

CITIZENS' GUIDE TO AIR QUALITY IN MONTANA



*Produced by Montana Department of Environmental Quality
Monitoring and Data Management Bureau*

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*Produced by Montana Department of Environmental Quality
Monitoring and Data Management Bureau*

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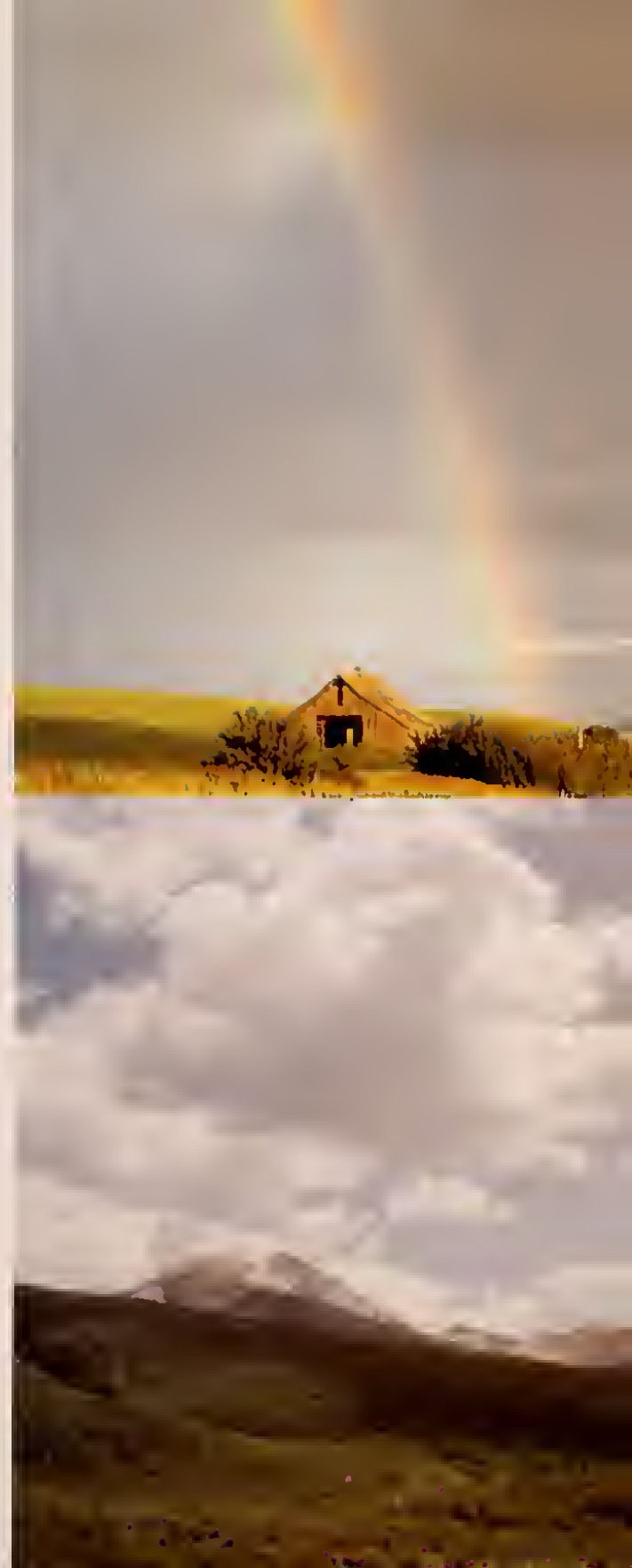


We, as citizens of the state of Montana, are indeed lucky: lucky each day to wake and breathe fresh clean crisp air and to view breathtaking scenic vistas extending across the plains to the mountains. Visitors to Montana from around the country, from around the world, marvel at our pristine air quality, and how we, the citizens of Montana, strive to keep our state, our home, "The last best place." Vigilance and an informed public are required to maintain the quality of life we in Montana expect and demand. All Montanans must participate to keep the balance between Montana's need for economic growth and the desire to protect the environment.

Our mission, as employees of the Department of Environmental Quality (DEQ), is to provide future generations a clean and healthful environment. That is why the staff here at DEQ is proud to present this *Citizens' Guide to Air Quality*. This Guide can be used to educate and to move each of us into becoming an active participant making informed decisions about Montana's environmental future. As decision-makers, citizens will then come to realize how finite resources must be allocated to meet a variety of important needs. Public participation is essential to ensure that future generations have and enjoy the same economic and environmental opportunities we have and enjoy today.

Our pristine environment is something we must not take for granted. I hope this Guide will help the public understand their role in determining Montana's air quality priorities as we head into the next millennium. I wish to extend my special thanks to the Monitoring and Data Management Bureau staff for all their hard work in producing this manual; and I encourage all Montanans to contact the bureau if you have questions or concerns about any information contained within this report.

Mark A. Simonich





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INTRODUCTION

Maintaining air quality in Montana is everyone's business. Whether in Montana homes, factories, offices, or on roadways, all Montanans have an important role to play in improving and preserving air quality. It's an ongoing effort involving citizens, industries, and government agencies throughout the state. The Department of Environmental Quality (DEQ) has prepared this guide to help Montanans understand the issues that affect not only the quality of air, but also the quality of life under the Big Sky.

This *Citizens' Guide to Air Quality in Montana* takes a sweeping look at the past, present, and future of air quality policy and maintenance in Montana, including:

- the historical events that helped shape federal and state policies;
- factors that contribute to poor air quality;
- how various pollutants affect public health and the environment;
- efforts to manage current and future air quality issues in Montana; and
- several simple ideas that everyone can use to help preserve and improve Montana's air quality.

This guide also includes additional sources of information for anyone who would like to further explore the sources, effects, and efforts to control air pollution in Montana and across the nation.

With this information, DEQ hopes that all citizens will better understand their role in managing, maintaining, and improving Montana's air quality for themselves, their environment, and their future.



NATIONAL AIR QUALITY EVENTS AND TRENDS

The federal government's involvement in air pollution control began in 1955 with the passage of Public Law 159. Congress adopted this measure in response to deteriorating air quality in the nation's industrial centers during the 1940s and 1950s. Eight years later, the passage of the Clean Air Act was the first bill that gave the federal government authority to get involved in solving the nation's pollution problems.

For the past 35 years, Congress has continued to expand and strengthen its role in promoting air quality management through a series of amendments designed to protect public and environmental health. Today, federal, state, and local governments continue to promote improved air quality in communities across the country. Most recently, the United States Environmental Protection Agency (EPA) issued new annual standards for particulate matter and ozone, which are expected to prevent each year approximately:

- 15,000 premature deaths;
- 350,000 cases of aggravated asthma; and
- 1 million cases of serious lung problems in children.



PHOTO COURTESY OF MONTANA HISTORICAL SOCIETY

Donora's Deadly Smog

In 1948, in a mill town 28 miles south of Pittsburgh, Pennsylvania, an air pollution disaster occurred that shocked the nation and, ultimately, gave birth to the Clean Air Act of 1970.

Donora, Pennsylvania, was home to the American Steel and Wire Co. zinc and iron works, where a large number of local residents were employed. On October 28, 1948, an inversion layer trapped sulfur dioxide emissions from the zinc works, exposing residents to a deadly cloud of sulfuric acid. Within a day, some elderly people were gasping for breath. One day later, nauseated patients crowded the area's two hospitals. By the third day, people in Donora were dying—the first known deaths from air pollution in America.

All told, 20 Donorans died before the acrid smog cleared, and 6,000 residents—nearly half of Donora's population—were temporarily sickened. The tragedy in this tiny Monongahela River town became a national symbol, often cited as proof that pollution can kill.

Within 20 years, American Steel and Wire Co. closed. The Donora tragedy (compounded by similar occurrences elsewhere in the country) prompted federal legislation to address air pollution.

Timeline of Significant National Air Quality Legislation and Events

1955
Congress adopts Public Law 159, which authorizes federal research of the nature and extent of the country's air pollution problems and develops air quality criteria.

1962
The publication of *Silent Spring* by Rachel Carson in 1962 focused public attention on the increasing use of DDT and other pesticides and the impact of these chemicals on wildlife. It is credited by many for creating public interest and enthusiasm in environmental issues across the United States.

1963
Congress passes the Clean Air Act of 1963 to provide grants to state and local agencies for regional pollution control programs. The Clean Air Act also gives the federal government the authority to mediate interstate pollution problems.

1965
Congress passes the Motor Vehicle Air Pollution Control Act stating that national standards should be set for automobile exhaust.

1967
Congress passes the Air Quality Act, expanding and strengthening federal authority over interstate pollution issues.

1970
Clean Air Act Amendments give EPA the authority to develop National Ambient Air Quality Standards (NAAQS) for airborne pollutants that have harmful effects on public health. These amendments require states to develop State Implementation Plans (SIPs) to reach these national standards and maintain good air quality. For the first time, citizens gain the right to participate in pollution control through public hearings.

1970
The first Earth Day celebration was held April 22, 1970. Stunning photographs from the Apollo space missions showing the earth from space and the surface of the moon, plus heightened awareness of environmental issues, made the first observance of Earth Day successful. Newspapers throughout the country published environmental information and campuses and communities sponsored lectures and rallies to raise environmental awareness.

1977
Federal government adopts additional Clean Air Act Amendments to regulate pollutants that have harmful effects on public and environmental health; ensure compliance with national and regional air quality standards; and establish special programs for hazardous air pollutants, visibility in national parks, and other air quality issues.

1984
In 1984 in Bhopal, India, a Union Carbide plant accidentally released a highly toxic chemical, methyl isocyanate, into the air. At least two thousand people died as a result of exposure to the chemical and many more thousands suffered adverse health effects. Soon after this incident, Congress passed the Emergency Planning and Community Right-to-Know Act (EPCRA) to require businesses to notify state and local authorities about toxic chemicals stored on site and released into the air.

1990
Federal government further amends the Clean Air Act, establishing additional programs to deal with nonattainment areas where the national standards have been exceeded, as well as vehicles and fuels, air toxics, acid rain, and operating permits for pollution sources.



The 1977 Clean Air Act Amendments established several new programs to better protect public and environmental health. These programs addressed three major areas:

Widespread and Pervasive Pollution Problems

Regulated emissions of criteria pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide) and major sources of pollution (power plants, gas stations, smelters, and residential houses).

New and Modified Stationary Sources

Required that new and modified pollution sources control emissions and comply with national and regional air quality standards.

Special Pollution Problems

Established national standards for hazardous air pollutants and new programs to protect visibility in national parks.

1990 Clean Air Act Amendments

The 1990 Clean Air Act Amendments established five programs to regulate the sources and consequences of specific air pollutants:

Title I: Nonattainment Program

Addresses problem pollutants in nonattainment areas, where national standards have been exceeded, and helps revise SIPs to bring these areas back into compliance.

Title II: Mobile Sources, Fuels, and Fuel Additives

Requires automobile manufacturers to reduce tailpipe emissions of hydrocarbons, carbon monoxide, and nitrogen oxides. This program also requires reformulated gasoline in areas with excessively high carbon monoxide and ozone levels.

Title III: Air Toxics

Controls hazardous air pollution by targeting the sources of pollution. Title III requires that major pollution sources use the best available control technologies to limit the amount of hazardous pollution released into the air. Title III also requires small businesses to comply with control technology standards for the same purpose.

Title IV: Acid Rain

Controls acid rain by reducing emissions of sulfur dioxide and nitrogen oxides, which come primarily from power plants and industrial facilities.

Title V: Operating Permit Program

Requires each state to develop an operating permit program that meets all federal regulations and includes emission limits, compliance schedules, and monitoring and reporting requirements.

MONTANA AIR QUALITY EVENTS AND TRENDS

At the turn of the century, air pollution was not regulated in Montana—knowledge of pollution control technology and the effect pollution had on people's health was limited. Big businesses put profits before prevention. In 1909, C. F. Kelley, secretary of the Anaconda Copper Mining Company, publicly stated:

"There is no legal objection to a pollution of the atmosphere until it results in damage to somebody, which gives him the right to formulate a cause of action or to complain. We have a perfect right to

carry on a legitimate business, and if incidentally we should pollute the atmosphere nobody has the right to complain until specific damage gives him a cause of action." (Inter Mountain, May 19, 1909)

Over time, Montanans' attitudes toward air pollution have changed. In addition to the federal regulations, Montana has adopted provisions to help prevent air pollution problems—before they arise—by controlling pollution at its source and establishing air quality standards to protect the health and welfare of all Montanans.

PHOTO COURTESY OF MONTANA HISTORICAL SOCIETY



1967 Montana State Board of Health and Environmental Sciences adopts air quality standards for several common pollutants.

1968 Clean Air Act of Montana is adopted, requiring new sources of air pollution to obtain air permits.

1972 Montana State Board of Health and Environmental Sciences establishes emission limitations for fuel burning equipment, industrial processes, incinerators, wood waste burners, pulp mills, smelters, petroleum refineries, motor vehicles, and other pollution sources.

1976 The East Helena lead smelter begins installing an acid plant, which ultimately eliminates about 85 to 90 percent of sulfur dioxide emissions in the community.

1977 An SO₂ nonattainment area is defined around Laurel after monitors find violations of the NAAQS. The state and Billings/Laurel area industries sign an EPA-approved stipulation to correct the problem.

1979 Montana Ambient Air Quality Study leads to enforceable standards. Standards apply to carbon monoxide, fluorides, lead, hydrogen sulfide, nitrogen dioxide, photochemical oxidants, sulfur dioxide, particulate matter, and visibility.

1980 Montana State Board of Health and Environmental Sciences adopts new, enforceable air quality standards. The Anaconda copper smelter closes, virtually eliminating sulfur dioxide emissions in the Anaconda area.

◀ Timeline of Significant Montana Air Quality Legislation and Events



PHOTO COURTESY OF MONTANA HISTORICAL SOCIETY

"We have a perfect right to carry on a legitimate business, and if incidentally we should pollute the atmosphere nobody has the right to complain until specific damage gives him a cause of action."

*C.F. Kelley, Secretary,
Anaconda Copper Mining Company
(1909)*

1987

After numerous attempts to attain Montana air quality standards for sulfur dioxide in the Billings/Laurel area, the Montana Legislature passes the Hannah Bill to lower area standards to the national level and give industries time to develop air pollution control plans.

1995

Reorganization of the Department of Health and Environmental Sciences into what is known today as the Department of Environmental Quality. The Board of Health and Environmental Sciences becomes known as the Board of Environmental Review.

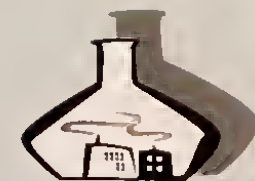
1997

Montana Legislature repeals the Hannah Bill, which results in uniform statewide sulfur dioxide standards.

Federal Clean Air Act requirements provide the framework for Montana's air quality program. However, the state has exceeded the federal requirements in many areas by:

- adopting tougher ambient air quality standards for certain pollutants;
- requiring a permitting program for smaller sources of pollution;
- providing emission control analyses to the regulated public to ensure that smaller sources of air pollution have the best emission control technology available;
- developing local air quality programs to regulate residential wood burning and road dust (the primary sources of particulate air pollution in Montana), as well as smaller sources of air pollution; and
- developing the Montana Smoke Management Plan and Open Burning Program to control the amount of harmful particulate matter that is released with smoke from prescribed burnings.

The State of Montana, through the Department of Environmental Quality and local governments, continues to actively address air quality problems throughout the state. At present, urban development is more of a threat to Montana's air quality than industrial activities (see p. 36).



Montana Ambient Air Quality Study

The Montana Ambient Air Quality Study evaluated the impacts of air pollution across the state. From 1978 through 1982, the study evaluated:

- The effects of air pollution on children and normal adults who suffered from lung disease;
- cancer-causing substances in the Butte/Anaconda area; and
- the number of deaths that could be tied to air pollution between 1970-1975.

The lung-function study showed that adults and children who were exposed to high levels of particulate matter or sulfur dioxide had worse lung problems than people from urban areas with less air pollution. These results established a clear connection between air pollution and decreased lung function in Montana citizens.

The study also evaluated cancer-causing particulate matter in 10 cities. Surprisingly, the study showed that residential wood burning was responsible for higher levels of cancer-causing particulate matter than light industrial sources.

Although there were strong indications that exposure to air pollution contributes to high death rates, the third area of study could not tie air pollution directly to death rates because of other unquantified factors such as cigarette smoking.

Local Air Quality Programs

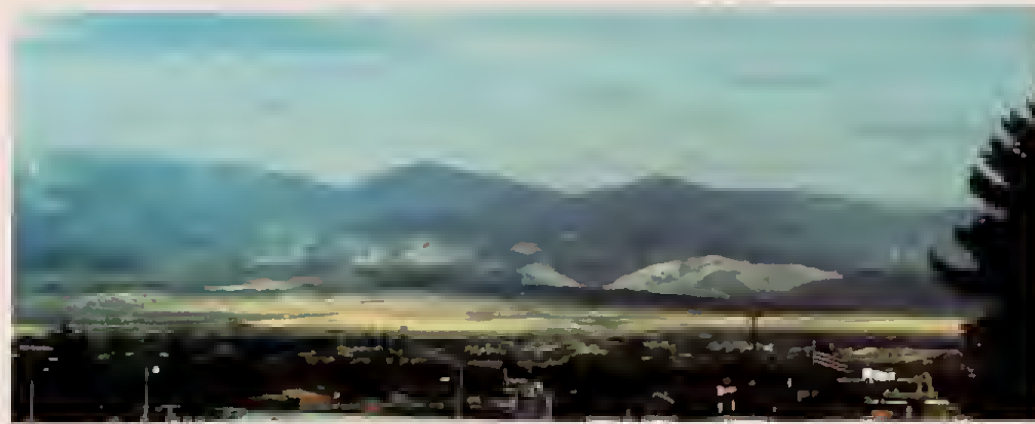
Montana allows any city or county to establish its own local air pollution control program. Seven counties currently operate local air pollution control programs that encompass the following communities: Billings, Butte, Great Falls, Helena, the northern Flathead Valley, Libby, and Missoula. These local air pollution control programs have jurisdiction over most pollution sources within their boundaries. The state government retains jurisdiction over larger pollution sources that have the potential to emit more than 250 tons per year of any regulated air pollutant or any facility that requires environmental impact statements.

Local air pollution control programs are responsible for ensuring good air quality in their communities and have proven themselves highly successful. Control strategies adopted by the local programs reflect the unique characteristics of citizens and their environment. Some of the roles assumed by local air programs include:

- developing local air quality rules that cannot be less stringent than state rules;
- permitting, regulating, and enforcing state and local air quality rules;
- conducting inspections of pollution sources;
- regulating open burning;
- regulating wood burning devices and issuing local air quality burning advisories;
- controlling the use and disposal of material on roads and in parking lots;
- controlling construction and demolition activities;
- assisting in the development of local State Implementation Plans; and
- responding to local complaints.

If a local air pollution control program is found to be inadequate, DEQ identifies the problems and asks the local program to develop solutions. If county authorities are unable to resolve the issues, the federal government requires the state to assume authority over the program.

Many of Montana's local air quality programs have played important roles in working with industries and residents to develop pollution control strategies for State Implementation Plans in areas that have exceeded pollution limits. These programs have been particularly successful in reducing particulate matter and carbon monoxide emissions.



Local air pollution control programs in Montana are highly effective in part because they reflect the unique social and environmental characteristics of the communities they serve.

UNDERSTANDING AIR QUALITY

Federal and State Air Quality Standards

Under the Clean Air Act of 1970, EPA developed primary and secondary National Ambient Air Quality Standards (NAAQS) for each of the seven criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, fine particulate matter, and sulfur dioxide. These standards establish pollution levels in the United States that cannot legally be exceeded during a specified time period. EPA referenced monitoring devices, placed at suspected locations of high concentrations,

measure specific airborne pollutants to determine if a standard will be exceeded.

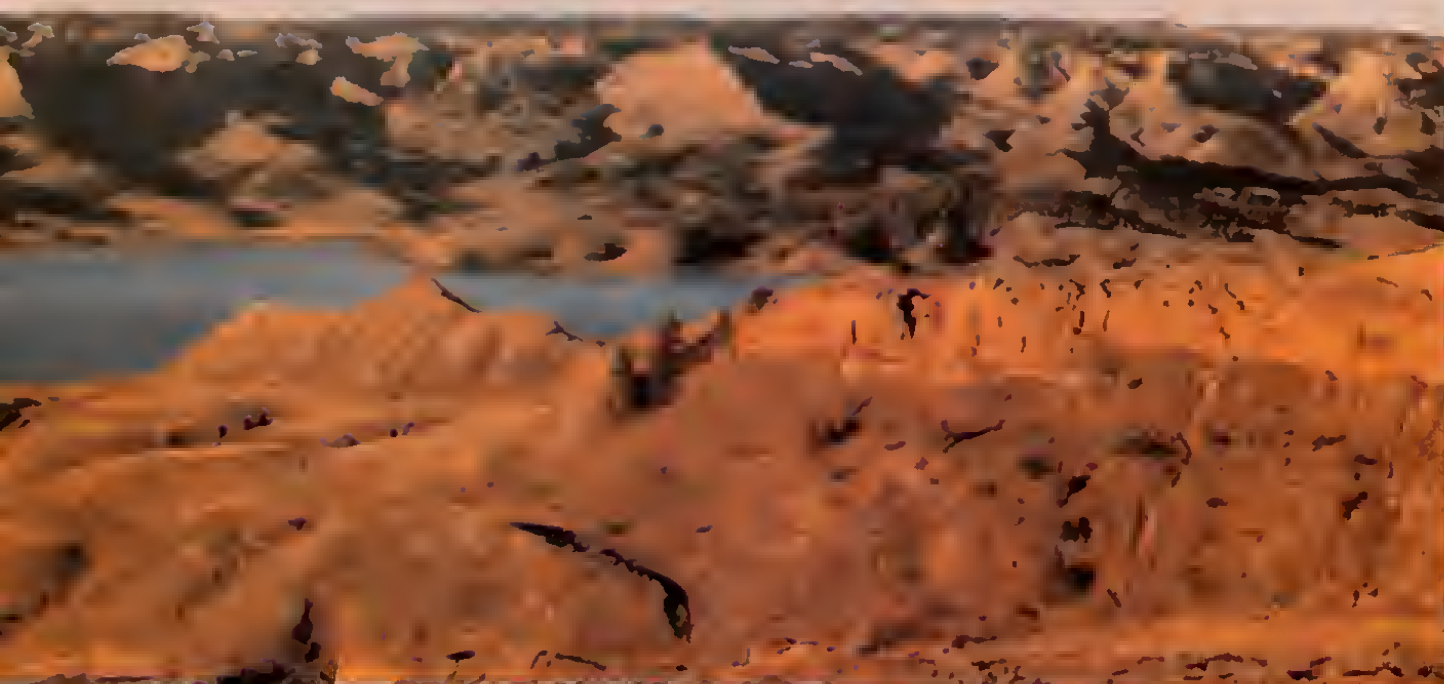
■ **Primary standards** are designed to protect human health, including “sensitive” populations, such as people with asthma and emphysema, children, and senior citizens. Primary standards were designed for the immediate protection of public health, with an adequate margin of safety, regardless of cost.

■ **Secondary standards** are designed to protect public welfare, including soils, water, crops, vegetation, buildings, property, animals, wildlife, weather, visibility, and other economic, aesthetic, and ecological values, as well as personal comfort and well-being. Secondary standards were established to protect the public from known or anticipated effects of air pollution.

Montana has adopted state air quality standards similar to the federal standards. These Montana Ambient Air Quality Standards (MAAQS) establish statewide targets for acceptable amounts of ambient air pollutants to protect human health. A list of these standards is included in Appendix B.

Criteria Pollutants

Criteria air pollutants were selected by EPA based on extensive scientific research showing the direct relationship between exposure to pollutants



and their short- and long-term effects on human health and the environment.

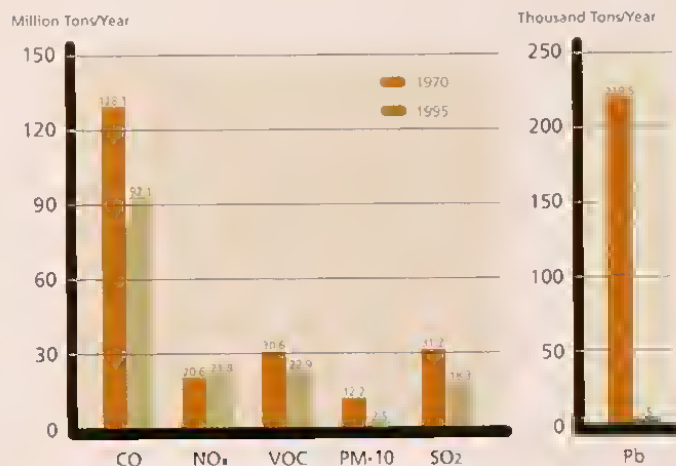
Between 1900 and 1970, national emissions of these criteria air pollutants increased with rapid industrial development and population growth. With careful monitoring, control strategies, and increased public awareness, total combined emissions of these criteria pollutants decreased between 1970 and 1995, even though America's gross domestic product, population, and total vehicle miles traveled increased significantly. Despite these improvements in air quality, nearly 80 million people still live in areas where air quality levels exceed the national standards for at least one of the criteria pollutants.

Carbon Monoxide (CO)

Nature and Sources of the Pollutant:

Carbon monoxide is a colorless, odorless, poisonous gas that is released into the air when carbon in fuels doesn't burn completely. It comes from vehicle emissions, factories, industrial boilers, house furnaces, and almost anywhere petroleum fuel is consumed. Nationally, highway exhaust from cars contributes almost 60 percent of all carbon monoxide emissions. In major cities, where more people drive more often, cars account for 95 percent of all carbon monoxide emissions. Concentrations of carbon monoxide in the air are highest in winter when automobile "cold starts" contribute to incomplete combustion and winter inversions keep carbon monoxide closer to the ground. Carbon monoxide is very stable, remaining in the atmosphere for two to four months.

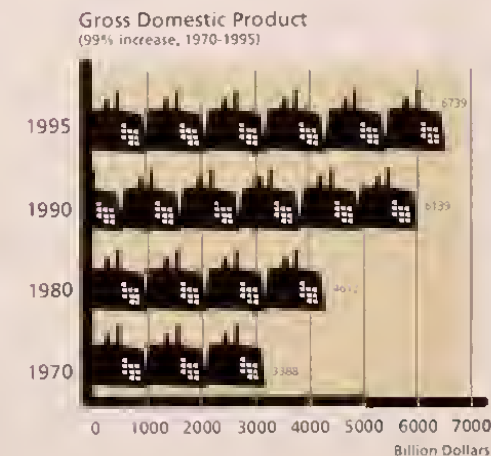
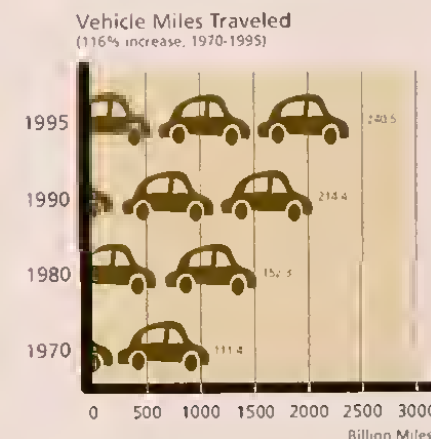
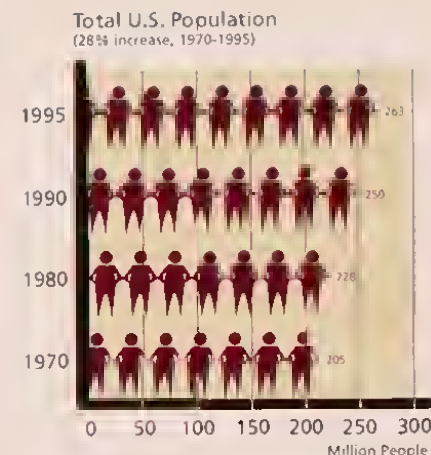
Comparison of 1970 & 1995 Emissions



Between 1986 and 1995, national average concentrations of carbon monoxide decreased 37 percent, and national emissions decreased 16 percent, despite the fact that there was a 31 percent increase in total vehicle miles traveled in the U.S.

Health and Environmental Effects:

Carbon monoxide becomes dangerous when people inhale excessive amounts in the air. Carbon monoxide enters the bloodstream and reduces the amount of oxygen that reaches vital tissues and organs, creating a number of possible health problems. The health threat from exposure to carbon monoxide is most serious for people who suffer from cardiovascular disease. Healthy people are also affected, but it takes more carbon monoxide to affect them. Exposure to high carbon monoxide levels can cause loss of eyesight, poor reflexes, diminished learning ability, difficulty in performing complex tasks, and all-around sluggishness. High enough concentrations of carbon monoxide absorbed into the bloodstream can also lead to death.



Pb

Lead (Pb)

Nature and Sources of the Pollutant:

Naturally occurring lead in our atmosphere is basically harmless. However, in some areas of the country, there are unnaturally high concentrations of lead in the air, soil, and water from human-induced sources. The highest concentrations of lead are found near metal smelters (other than iron smelters) and battery plants. Vehicle exhaust was also a major source of lead before federal regulations reduced the amount of lead allowed in fuels by 90 percent in 1986. In 1995, federal regulations eliminated lead from fuel completely.

As a direct result of using unleaded gasoline in vehicles, average lead concentrations in urban air nationally decreased 78 percent between 1986 and 1995, while total lead emissions decreased 32 percent.

Health and Environmental Effects:

People become exposed to lead by breathing air with high lead concentrations or by ingesting food, water, paint, soil, or dust containing lead. Children are especially susceptible to lead poisoning because it takes smaller amounts to damage their bodies than it does for adults, and children are more likely to put dirt, paint chips, and other lead-based materials in their mouths. Once lead is in the body, it accumulates in the blood, bones, and soft tissue, causing damage to the kidneys, liver, and central nervous system. Low doses of lead in children can cause central nervous system damage and slowed growth. Excessive exposure can result in anemia, kidney disease, reproductive disorders, and neuro-

logical problems such as seizures, mental retardation, and/or behavioral disorders. Recent studies have also indicated that lead may contribute to high blood pressure and heart disease in middle-aged white males and osteoporosis in post-menopausal women.

NO₂

Nitrogen Dioxide (NO₂)

Nature and Sources of the Pollutant:

Nitrogen dioxide belongs to a family of gases called nitrogen oxides (NO_x). Burning fuel at high temperatures in motor vehicles, electric utilities, and industrial boilers releases nitrogen dioxide into the air. Average nitrogen dioxide concentrations across the country in 1995 were 14 percent lower than in 1986, and 1995 was the fourth year in a row that all monitoring stations across the country met the federal nitrogen dioxide air quality standard.

Health and Environmental Effects:

Prolonged exposure to nitrogen dioxide can irritate the lungs and lower a person's resistance to respiratory infections such as influenza. Continued exposure to high concentrations of nitrogen dioxide may result in a greater number of acute respiratory illnesses in children.

The brownish gas reacts with moisture in the air to form nitric acid, which can corrode buildings and monuments, and toxic organic nitrates, which contribute to acid rain and the acidification of lakes, rivers, and streams. Nitrogen dioxide also plays a major role in producing ground-level ozone, or smog.

Naturally occurring lead in the atmosphere is basically harmless, but high concentrations of lead in the air, soil, and water can cause numerous health and environmental problems. The highest concentrations of lead pollution are found near metal smelters and battery plants



Ozone (O₃)

Nature and Sources of the Pollutant:

Ground-level ozone (the primary ingredient in smog) is unique among the criteria pollutants because it is not released directly into the atmosphere. Nitrogen oxides and volatile organic compounds (VOC) are gases that are released into the air through gasoline vapors; chemical solvents; fossil fuel combustion; consumer products such as paint and coatings, solvents and degreasers, and glues or adhesives; and industrial facilities. Once in the air, these gases react with sunlight to form ozone. These photochemical reactions often occur hundreds of miles from where the VOCs and nitrogen oxides were released, making ozone a very difficult pollutant to control. Forest ecosystems also release significant quantities of VOCs. Peak ozone concentra-

Ozone has the same chemical structure whether it occurs high above the earth or at ground level and can be good or bad depending on its location in the atmosphere. The earth's atmosphere is composed of several layers—ozone occurs in two of them: the troposphere and the stratosphere.

The layer surrounding the earth's surface, and extending about 10 miles up, is the troposphere. Here, ground-level or "bad" ozone damages health, vegetation, and many common materials.

Ten miles above the earth's surface, the troposphere meets the stratosphere, which extends upward from about 6 miles to about 30 miles above the earth's surface. This layer contains "good" ozone that protects life on earth from the harmful ultraviolet rays emitted by the sun. When the ozone layer thins, more ultraviolet light reaches earth, causing cancer, cataracts, impaired immune systems, and destruction of plants.

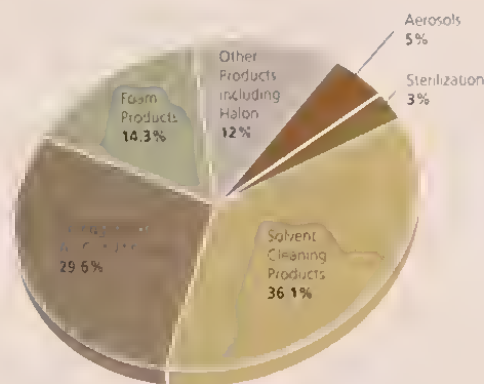
Ozone occurs naturally in the stratosphere and is produced and destroyed at a constant rate. This "good" ozone is gradually being destroyed by chemicals such as chlorofluorocarbons (CFCs), halons, and other ozone-depleting agents used in coolants, foaming agents, fire extinguishers, solvents, and aerosols.

These materials break down in the stratosphere to form chlorine and bromine molecules. One chlorine or bromine molecule can destroy 100,000 ozone molecules, so ozone is currently being destroyed much more quickly than nature can replace it. It sometimes takes these ozone-depleting chemicals years to reach the stratosphere. Substances released into the air today will contribute to ozone destruction well into the future.

Preserve the Ozone Layer

- Make sure that technicians working on your car air conditioner, home air conditioner, or refrigerator are certified by an EPA-approved program to recover the refrigerant (this is required by law).
- Have your car and home air conditioner units and refrigerator checked for leaks. Repair leaky air conditioning units before refilling them.
- Contact local authorities to properly dispose of refrigeration or air conditioning equipment.





Sources that Harm the Protective Ozone Layer

tions generally occur during hot, stagnant conditions in the summer during late afternoon.

Health and Environmental Effects:

High concentrations of ground-level ozone are a major human and environmental health concern. Scientific evidence indicates that ground-level ozone affects not only people with impaired respiratory systems (such as asthmatics), but also healthy adults and children. Ozone causes irritation, congestion, and swelling in the lungs, along with symptoms such as coughing and chest pain. Experiments have shown that repeated exposure to high levels of ozone for several months or more can produce permanent structural damage in the lungs. High ozone concentrations also cause damage to the leaves of plants,

resulting in the loss of agricultural crop yields and forest ecosystems. Many of the chemicals that cause ground-level ozone also contribute to other health effects, including cancer and tissue and organ damage.

Particulate Matter (PM-10 and PM-2.5)

Nature and Sources of the Pollutants:

The term particulate matter refers to tiny liquid or solid particles in the air. These particles can be released directly into the air from many different sources, therefore, their chemical and physical compositions vary widely. Like ozone, particulate matter can also form in the atmosphere when gaseous pollutants, such as sulfur dioxide and nitrogen oxides, react with sunlight to create fine particles.

The size of particulate matter suspended in the

The most common sources of particulate matter are fly ash, carbon black, soot, smoke, and fugitive dust from unpaved roads and construction sites.

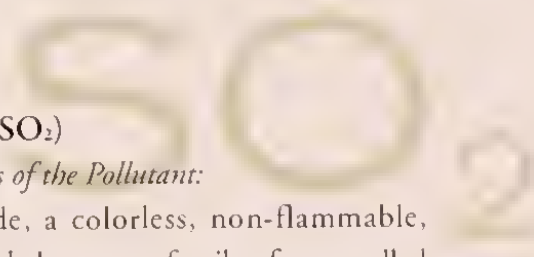




air ranges from less than 0.1 micron (micrometer) in diameter up to 50 microns. Each micron measures approximately 0.0004 inch, or one-seventh the width of a human hair. Particles larger than 50 microns in diameter are too heavy to stay suspended in the air for long periods—they fall very close to their source before people can inhale dangerous amounts. Particles less than 2.5 microns in diameter, which are easily inhaled deep within the lung system, have the greatest effect on human health. Burning processes are the most common sources of this very fine particulate matter—fly ash (from power plants), carbon black (from automobiles and diesel engines), and soot (from slash burning, forest fires, fireplaces, and wood stoves). Particles between 2.5 and 10 microns are usually associated with fugitive dust from wind-blown sand and dirt from roadways, fields, and construction sites.

Health and Environmental Effects:

In 1987, EPA tightened the earlier, more general particulate standard with a new standard to target smaller, more harmful particles with a diameter of 10 microns or less (PM-10). In 1997, EPA added an air quality standard for particles with a diameter of 2.5 microns or less (PM-2.5). The smaller PM-2.5 particles, often referred to as “fine particulates,” are easily inhaled and can cause tissue damage, emphysema, bronchitis, and cardiovascular complications. Children, seniors, and individuals with pre-existing respiratory diseases are most susceptible to these health risks. Any secondary particulate formation is a major cause of reduced visibility and can produce acid rain.



Sulfur Dioxide (SO₂)

Nature and Sources of the Pollutant:

Sulfur dioxide, a colorless, non-flammable, non-explosive gas, belongs to a family of gases called sulfur oxides (SO_x). High-temperature burning processes like smelting, oil refining, and power generation create sulfur dioxide when they burn sulfur-containing fuels, such as coals, natural gases, and oils.

Health and Environmental Effects:

Illnesses associated with exposure to high concentrations of sulfur dioxide include chronic lung diseases such as bronchitis and emphysema. Children, seniors, and people with asthma are most susceptible to adverse health effects associated with exposure to sulfur dioxide. Sulfur oxides also



Poor visibility in Montana is caused by fine particles that scatter and absorb light. In Montana, the biggest sources of impaired visibility include wildfires, prescribed burning, power plants, motor vehicles, and certain industrial and chemical facilities.



contribute to acid rain, acidification of lakes and streams, accelerated corrosion of buildings and monuments, and reduced visibility.

Regional Air Quality Concerns

Air pollution that lingers in the atmosphere for long periods of time can be transported great distances. As a result, many pollutants cause regional problems far from their emission sources. These regional problems include impaired visibility, acid rain, and smoke from open and prescribed burning.

Visibility

Nature and Sources of the Pollutant:

Airborne particulate matter, which includes solid particles as well as liquids and gases, is the main ingredient in haze. Haze impairs visibility because the fine particles within the airborne particulate matter scatter and absorb light, limiting the ability to see distant objects. Some particles, such as sul-

fates and nitrates, become larger as humidity in the air increases, resulting in even more haze and reduced visibility. Weather conditions can also cause chemical reactions between air pollutants, creating fine particles that remain in the air for several days. As a result, particles transported from urban and industrial areas may contribute to poor visibility in national parks and other wilderness regions.

The eastern United States has poorer visibility than the western part of the country due to generally higher humidity levels and a greater number of independent sources that emit particulate matter. Visibility in the eastern United States should be approximately 90 miles, but regional haze has reduced it to between 14 and 24 miles. In the western United States, visibility should be about 140 miles, but is currently closer to 33 to 90 miles due to regional haze. Visibility varies seasonally and is generally worse during the summer months, when humidity is higher and the air is stagnant.

Two of Montana's chief sources of visibility impairment are wildfires and prescribed burning. Other sources include unpaved roads, fallow fields, and soot from power plants, motor vehicles, and petroleum and industrial chemical facilities.

Health and Environmental Effects:

Particulate matter in haze the size of PM-10 or PM-2.5 is small enough to easily be inhaled by humans. Once inhaled, the particles lodge in the lungs, where they can cause severe health problems. Poor visibility may also damper people's enjoyment of national parks, wilderness areas, and the spectacular vistas these places offer.

Acid Rain

Nature and Sources of the Pollutant:

Acid rain is formed when sulfur dioxide and nitrogen oxides are released into the atmosphere, where they react with water, oxygen, and oxidants to form acidic compounds. These compounds fall to Earth in either dry form (gas and particles) or wet form (rain, fog, or snow). Smog, a combination of ozone and hydrocarbon pollutants, is also considered a form of acid rain. It is typically associated with large urban areas that have periods of stagnant air and warm temperatures.

Health and Environmental Effects:

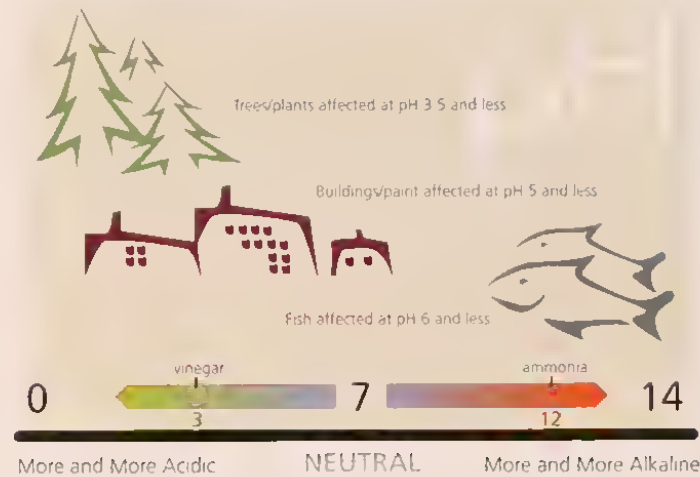
Major human health concerns associated with exposure to acid rain include effects on breathing and the respiratory system, damage to lung tissue, cancer, and premature death. In the environment, acid rain raises the acid levels of lakes and streams, making the water unsuitable for fish and aquatic life. Acid rain also damages trees at high elevations. Deterioration of cars, buildings, and historical monuments can also result from acid rain. Smog is easy to recognize from its effect on visibility and its noxious odor.

Open Burning/Prescribed Burning

Nature and Sources of the Pollutant:

Prescribed burning is often used as a tool in forest and range management to increase habitat for wildlife, improve cattle range, dispose of crop residue, control pests and disease, and reduce wildfire hazards. Open burning is used by a variety of industries, landfills, and Montana residents to limit

The pH Scale



the accumulation of clean, untreated wood.

Both open and prescribed burning release numerous air pollutants into the atmosphere, including particulate matter in the form of smoke.

Cascade, Flathead, Lincoln, Missoula, and Yellowstone counties, as well as all of Montana's Native American reservations, control open burning through local county air programs and health departments. DEQ controls open burning in all other counties in the state. In general, open burning activities are conducted from March through November when there is better air dispersion. This eliminates complications from wintertime inversions, which hold smoke close to the ground, increasing the chances that pollution will have adverse health effects on local communities. A statewide Smoke Management Hotline provides up-to-date information about burning restrictions around the state.

Residential wood-burning devices (wood stoves, fireplaces, pellet stoves) are also major contributors



Operating Expenses

Operating ambient monitoring stations for criteria pollutants is expensive for DEQ. Installation and operation of one continuous gaseous monitoring station costs about \$100,000 for the first year of data collection and about \$25,000 for each following year. Of the \$100,000 for the first year, the new monitor costs around \$15,000. Additional expenses include:

- Leasing land for the monitoring station;
- bringing power to the station;
- shelter to house equipment;
- electronic data collection equipment;
- meteorological equipment;
- site installation; and
- site visits, operation, and maintenance.

to particulate emissions. In an effort to help reduce the impacts from woodstove emissions, several local governments have enacted "Woodstove Curtailment Programs." These programs give local officials the authority to limit woodstove use when ambient particulate levels indicate a buildup of pollutants in the airshed.

Health and Environmental Effects:

The major health effects from burning are similar to the effects of particulate matter emissions.



SMOKE MANAGEMENT HOTLINE 1-800-225-6779

Funded by major open burners in Montana, the Smoke Management Program maintains a Smoke Management Hotline. The purpose of this hotline is to provide a current summary of burning restrictions across Montana. The Program also prevents the accumulation of smoke from prescribed burning by coordinating planned burns and conducting scientific monitoring. Members of the Program submit a list of planned burns describing the type of burn, number of acres, location, and elevation of each site. The Smoke Management Program issues planned burning notices, launches and tracks weather balloons, and restricts burning when conditions prevent good smoke dispersion. The Smoke Management Program also promotes good burning practices and alternatives to burning that reduce or prevent smoke.

Particulate matter that is generated by open and prescribed burning is predominantly PM-2.5, which people can easily inhale.

Prevention of Significant Deterioration/ New Source Review

The Clean Air Act requires that all new and modified stationary sources of air pollution obtain a preconstruction permit. This New Source Review permitting process is required in both nonattainment areas, where state and national standards are exceeded, as well as attainment and unclassified areas, where air quality is currently acceptable. In nonattainment areas, these permits are called Nonattainment Area Permits. Permits in attainment or unclassified areas are called Prevention of Significant Deterioration (PSD) permits. EPA has identified three basic goals of the PSD regulations:

- to ensure that economic growth will occur in harmony with the preservation of existing clean air resources;
- to protect the public health and welfare from any adverse effects that might occur, even when air pollution levels are better than state and national standards; and
- to preserve, protect, and enhance the air quality in areas of natural, recreational, scenic, or historic value, such as national parks and wilderness areas.

New and modified pollution sources under PSD review must show that they have the Best Available Control Technology (BACT). These sources must also conduct an ambient air quality

analysis to show that they will meet all air quality standards. The permitting process further requires a review of air quality effects on soils, vegetation, and visibility. New and modified sources may not adversely effect any area designated as Class I, including national parks, some tribal reservations, and wilderness areas. Public participation is required as a part of the permitting process.

Regulations for new or modified sources in nonattainment areas are designed to ensure emissions are controlled to the greatest degree possible to keep their impacts below significant levels and to proceed toward achieving state and national standards. Sources in nonattainment areas must demonstrate that the Lowest Achievable Emission Rates (LAER) of the violating pollutants will be achieved without economic considerations. Sources must also

New and modified pollution sources must show that they have the best pollution control technology available before EPA will grant an operating permit. The permitting process also requires a review of potential air quality effects on soils, vegetation, and visibility



National parks and national wilderness areas are mandatory Class I areas. The reservations identified as Class I areas were selectively designated. Wilderness designated as a wilderness area before 1977 and more than 25,000 acres were Class I. The rest of Montana is designated as Class II—no Class III areas currently exist in Montana.



show that these emissions will be offset by reductions of the same pollutant from other sources in the nonattainment area.

Prevention of Significant Deterioration Area Classification

Prevention of Significant Deterioration (PSD) area classification requirements let states plan for local land use. Each PSD classification differs in the amount of development it will allow. Acceptable

growth is estimated using computerized air dispersion modeling techniques to gauge the effects of current and potential pollution sources on surrounding areas. PSD regulations allow for three area classifications:

- Class I areas allow the smallest incremental growth and accommodate only a small degree of air quality deterioration;
- Class II areas can accommodate normal, well-managed industrial growth; and
- Class III areas allow the largest increments of growth and provide for a larger amount of development than either Class I or Class II areas.



Air Dispersion Modeling

Air Dispersion Modeling is a tool used by industries and government agencies to predict the impacts of air pollution based on emission sources, local weather, and regional topography. Computerized air dispersion models provide results that identify the highest pollution concentrations. These results are then compared to PSD incremental growth guidelines and air quality standards.

Congress has identified several mandatory Class I areas and allows state and tribal authorities to designate other Class I areas.

In Montana, the following areas have been designated as Class I areas:

- National Parks: Glacier and Yellowstone;
- National Wilderness Areas: Anaconda-Pintler, Bob Marshall, Cabinet Mountains, Gates of the Mountains, Medicine Lake, Mission Mountains, Red Rock Lakes, Scapegoat, Selway-Bitterroot, and UL Bend; and

■ Native American Reservations: Northern Cheyenne, Flathead, and Fort Peck.

Nonattainment Areas

Areas that violate federal or state air quality standards are designated nonattainment areas. EPA declares each area nonattainment for a specific pollutant such as carbon monoxide, particulate matter, etc. Nonattainment areas for different pollutants may overlap each other or share common boundaries.

Montana has 17 nonattainment areas. Fourteen of these nonattainment designations are under state jurisdiction, and the other three are on Native American reservations with tribal/EPA jurisdiction. Montana's nonattainment areas include 14 communities, three of which violate standards for more

than one pollutant. Particulate matter is the most common cause of nonattainment in Montana.

DEQ has worked, and will continue to work, with communities and industries in each nonattainment area to develop a State Implementation Plan (a control plan) that will bring the area back into compliance with the federal ambient air quality standards. Each community chooses its own control strategies to attain compliance. These plans require an inventory of all emission sources of the relevant pollutant in the area. DEQ then meets with each community to determine the best control strategies for that community, but the community has the final say on which control strategies will be implemented.

Most sources contributing to lead and sulfur dioxide nonattainment problems in Montana are

Attainment

When an area is designated as attainment for any of the criteria pollutants, the control technology requirement is BACT. A BACT analysis must be submitted by the source to be approved by the state air permitting agency on a case-by-case basis. This analysis considers energy, environmental, and economic costs.



Air Quality Nonattainment Areas

CO SO₂
Pb PM₁₀

- 1 Billings
- 2 Butte
- 3 Columbia Falls
- 4 East Helena
- 5 Great Falls
- 6 Kalispell
- 7 Lake Deer (Tribal/EPA)
- 8 Laurel
- 9 Libby
- 10 Missoula
- 11 Polson (Tribal/EPA)
- 12 Ronan (Tribal/EPA)
- 13 Thompson Falls
- 14 Whitefish



Montana's narrow valleys and regional climate often cause temperature inversions, which trap pollutants in cold air along valley floors. Inversions become even more problematic in urban areas where vehicle exhaust, smoke from wood stoves, and industrial processes are more concentrated



industrial sources located in the East Helena and Billings/Laurel areas. Sources contributing to the carbon monoxide nonattainment status in Missoula, Billings, and Great Falls include vehicle emissions, wood burning sources, and industrial emissions. Particulate matter nonattainment was often the result of excessive road dust, wood burning sources, and industrial emissions.

Many of Montana's nonattainment areas are valley communities, and the state's topography and weather play a big role in their failure to attain air quality standards. Narrow valleys restrict good dispersion of pollutants, especially during winter, when low winds can cause atmospheric temperature inversions. Inversions complicate the impact of air pollution by trapping pollutants in cold air along valley floors under a layer of warm air. Inversions can last for several days and sometimes longer than a week.

Billings/Laurel SO₂ SIP Case History

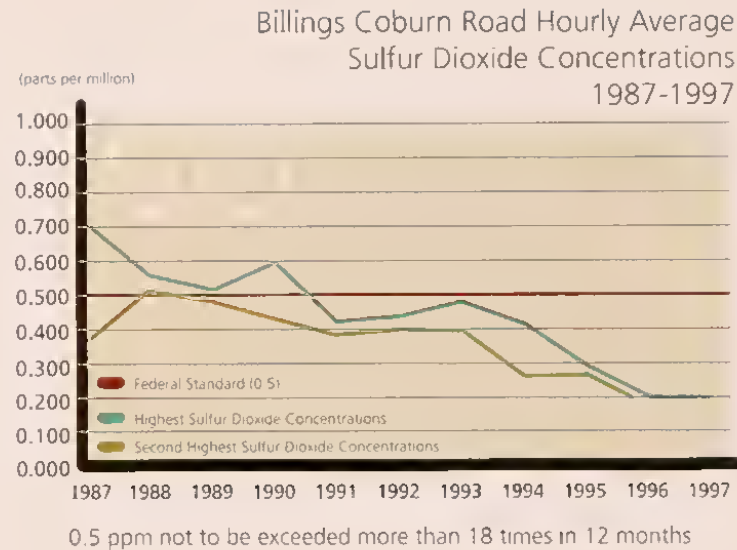
In the 1970s, the Billings/Laurel area had the third highest level of sulfur dioxide emissions in the state. Anaconda and East Helena ranked first and second because of greater sulfur dioxide emissions from local smelters. The Billings/Laurel area is estimated to have emitted as much as 50,000 tons of sulfur dioxide per year from three oil refineries, a coal-fired power plant, a sugar beet refinery, and a sulfur recovery plant. Fuel burning and process emissions were the major sources of sulfur dioxide emissions.

EPA approved a SIP in the late 1970s aimed at reducing sulfur dioxide impacts in the Billings/Laurel community. This SIP focused mainly

on fuel burning sources at local industries and restricting the sulfur content of industrial fuels to no more than one pound of sulfur per million British thermal units (BTUs). During combustion, one pound of sulfur produces two pounds of sulfur dioxide. The SIP also required several industries to increase the height of their exhaust stacks to improve pollutant dispersion. These were the only two control strategies in the SIP from the late 1970s. No controls were applied to industrial processes that emitted sulfur dioxide, even though they represented about half of the released emissions, and no industry was limited by a sulfur dioxide emissions cap in the SIP. Ultimately, the area around the Cenex oil refinery in Laurel was designated a sulfur dioxide nonattainment area by EPA.

The 1970s SIP produced minor improvements in air quality near the industrial plants, primarily because the installation of taller stacks transported the pollution farther downwind. Still, there was no significant reduction in overall emissions released by industries as a result of these control strategies. Ambient air impacts were still high in Billings, and the area failed to comply with state air quality standards, although the federal standards were met.

In 1987, Yellowstone County legislators convinced Montana's legislature to pass the Hannah Bill, which replaced the more stringent state sulfur dioxide standards for Billings/Laurel area industries with the more lenient federal standards. This proved to be only a short-term solution for the area. The down side of the Hannah Bill was that it restricted economic industrial development, because the federal standards applied only to existing sources, and any new source was required to demonstrate



compliance with the more stringent state standards.

In the 1980s, the Billings/Laurel area experienced slow economic growth. None of the industries planned or proposed expansions or changes in operation, and no new industrial sources of sulfur dioxide opened in the area. Because of this slowdown in major source activity, the existing SIP was not reviewed, although its effectiveness remained in question.

In the early 1990s, a major new industrial facility planned to open and operate in the Billings/Laurel area. Upon notification of the new facility, EPA recalled the existing SIP claiming that it was insufficient to control sulfur dioxide emissions. Under the revised SIP, industries selected their own control strategies to meet new emission limits. The industrial sources were assigned short-term (pounds per hour) limits in addition to the annual emission rates. Dispersion modeling was used to demonstrate that when facilities operated under

both short-term and annual limitations, there would be no compliance deficiencies with federal standards.

There was concern that the Hannah Bill was discriminatory to the citizens of the Billings/Laurel area, who were subject to higher sulfur impacts than other residents in Montana. Rather than face potential litigation, the State Legislature repealed the Hannah Bill in 1997, and now the Billings/Laurel area must comply with the same sulfur dioxide standards as all other parts of Montana. Today, compliance with Montana standards is measured through ambient monitoring rather than air dispersion modeling.

Recent ambient monitoring in Billings shows full compliance with Montana air quality standards. Sources have current estimated combined annual sulfur dioxide emissions of around 20,000 tons per year. Under the federal sulfur dioxide SIP, industrial sources in Billings are allowed only 36,000 total tons per year, which has raised concern that future industrial operations may increase the ambient impacts. DEQ will continue monitoring sulfur dioxide impacts in the Billings/Laurel area and plans to respond to excessive sulfur dioxide emissions if a violation is detected.

East Helena Lead SIP Case History

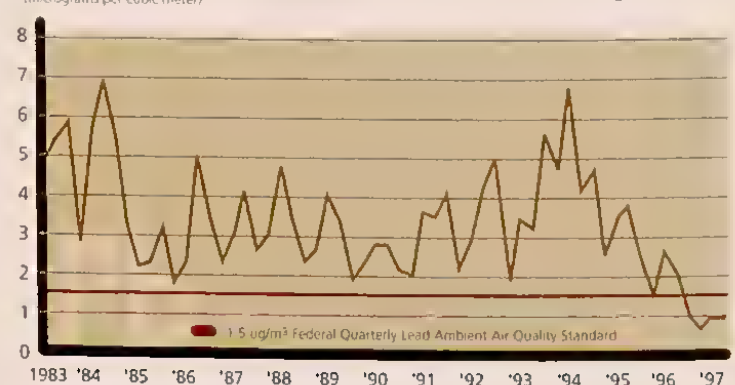
The community of East Helena first exceeded ambient air quality standards for lead in the 1980s. Sources contributing to lead impacts included the ASARCO lead smelter, American Chemet, road dust, and automobile emissions. State government began extensive studies that included a chemical mass balance technique to identify specific sources and processes within the ASARCO facility and the East Helena community that were contributing to airborne lead.

In 1983, the Department of Health and Environmental Sciences (DHES—DEQ's predecessor) and ASARCO agreed to control lead emissions from the smelter. A plan outlining the controls was submitted to EPA as the 1983 Lead SIP. After EPA approval in 1984, the plan was expected to bring East Helena into compliance with federal lead standards. Although all control strategies were implemented by the end of 1986, East Helena continued to exceed the federal lead standard. In 1988, EPA declared that the lead SIP was inadequate and would have to be revised.

Fluctuations are due to meteorological and production operations

1994 shows a marked reduction in emissions due to SIP revisions requiring additional control strategies

East Helena Firehall Quarterly Average Lead Concentrations
(micrograms per cubic meter) 1983-1997



DHES and ASARCO re-evaluated the inventory of emission sources and still concluded that virtually all ambient lead in the area continued to originate from the ASARCO facility, with only a small amount of ambient lead coming from the American Chemet facility.

Montana failed to meet initial federal deadlines for the submission of a revised SIP, so EPA imposed sanctions requiring a 2:1 emission offset for any proposed new emission sources in East Helena. The emissions offset sanction required that any newly proposed source of lead emissions must demonstrate a reduction of twice the emissions from another source in the area. These sanctions will be lifted when EPA approves a revised SIP.

Final revisions to the SIP were submitted to EPA in 1996. These revisions included shutting down several parts of the ASARCO operation, improving smelting technologies, controlling fugitive emissions, installing more efficient pollution control technologies, and operating a paved road cleaning program in the East Helena area. All of these proposed control strategies have been implemented, even though EPA has still not approved the SIP revisions. The control strategies have resulted in improvements to East Helena's air quality. Monitoring has shown a reduction in ambient lead levels since 1994 and demonstrates that the ambient standard has not been exceeded since 1996.

Kalispell PM-10 SIP Case History

Kalispell first exceeded national and state air quality standards for PM-10 in 1988. In 1989, EPA designated Kalispell a nonattainment area for PM-10. DHES was then required by federal regulations to develop a control strategy to help the community attain levels that would meet the PM-10 standard.

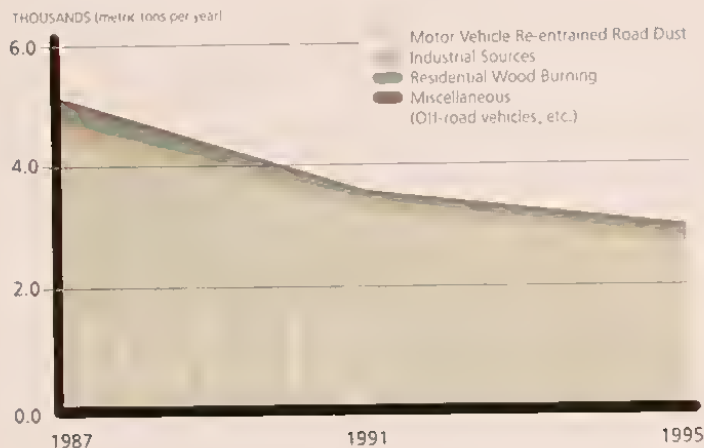
The first step involved the creation of a Technical Advisory Committee. The Committee included a city representative, a local citizen, and several woodstove sales representatives. The Committee was developed with the neighboring community of Columbia Falls, which was also experiencing PM-10 problems.

The second step included a chemical mass balance project to collect one year's worth of monitoring data to identify the sources of PM-10 emissions and the impact each source was having on the problem. The monitoring results from the study indicated that material from road dust, gravel roads, parking lots,



Monitoring results in the Kalispell area indicate that material from road dust, parking lots, and construction activities were the major contributors to the area's excessive levels of ambient particulate matter.

Kalispell PM-10 Estimated Annual Emissions



Use of liquid de-icer instead of sand and gravel has helped Kalispell control its particulate matter problem. Since 1996, Kalispell has shown a continued reduction in PM-10.

and construction activities in Kalispell were the main sources of the area's particulate matter. The study identified burning from wood stoves and open fires as the secondary source of PM-10.

The control strategies developed by the Technical Advisory Committee with assistance from DEQ to reduce PM-10 impacts included:

- new specifications for sand and gravel applied to local roads for snow and ice traction;
- use of liquid de-icer for snow and ice traction;
- paving roads averaging more than 200 car trips per day;
- paving of large unpaved parking lots;
- adopting a voluntary woodstove program to curtail burning during periods of poor air quality; and
- encouraging construction sites to control dust emissions with water, windbreaks, and/or enclosures.

The proposed control strategies were applied to an area slightly larger than the city limits of Kalispell (generally within one mile of the city limits). Kalispell chose this control area because of residential and industrial growth surrounding the city and the fact that air pollution doesn't stop at political boundaries.

Flathead County approved these proposed control strategies in 1991, but EPA did not offer its approval until 1996. Since then, Kalispell has shown a continued reduction in annual tons of PM-10 emissions as well as a decline in measured 24-hour ambient air concentrations of PM-10.

DEQ and the City of Kalispell have not yet requested that EPA redesignate the area as an attainment area; however, planned revisions of the old PM-10 standard will likely result in an attainment designation for the area. In addition to improvements in air quality, human health, and environmental quality, Kalispell also benefits aesthetically from the control strategy program:

- use of liquid de-icer in winter reduces the number of springtime dust clouds on Kalispell's streets;
- paved parking lots keep patrons' shoes and cars cleaner;
- paved parking lots are often landscaped, adding to the attractiveness of the community; and
- refraining from wood burning during periods of poor air quality improves the overall air quality in neighborhoods.

Missoula Carbon Monoxide SIP Case History

Throughout much of its history, Missoula has been plagued by air-pollution problems because it is an urban area surrounded by mountains. Missoula sits on the valley floor with the Bitterroot Range to the west and southwest, the Sapphire Mountains to the southeast, and the Reservation Divide to the north. The area is subject to severe temperature inversions in winter, which keep pollutants concentrated in the valley and pose a health risk to Missoula residents. Carbon monoxide and

particulate matter have both been problem pollutants for this community.

EPA designated the city of Missoula a nonattainment area for carbon monoxide in 1978 based on less than one year of monitoring data collected by Missoula County and DHES. The 1977 data showed 55 measurements that exceeded the eight-hour national standards by as much as 50 percent at monitoring stations downtown and at the intersection of Brooks Street (U.S. Highway 12), Russell Street, and South Avenue.

A carbon monoxide emission inventory compiled in 1979-1980 indicated that transportation sources were responsible for 59 percent of winter carbon monoxide emissions, residential wood burning contributed 39 percent, and industrial sources contributed two percent. To reduce carbon monoxide levels, Missoula decided to focus on decreasing emissions from motor vehicles and wood stoves.

A Technical Advisory Committee in Missoula developed control strategies for transportation with assistance from DHES. The committee worked to reduce delay times at intersections to keep traffic flowing through town. When traffic is delayed at intersections, carbon monoxide builds up from the idling exhaust. Locally dubbed "Malfunction Junction," the intersection of Brooks Street, Russell Street, and South Avenue received the most attention because of its high traffic volumes traveling at a slow pace, which caused high carbon monoxide concentrations. The control plan also relied upon newer cars meeting federal tailpipe standards to reduce carbon monoxide levels.

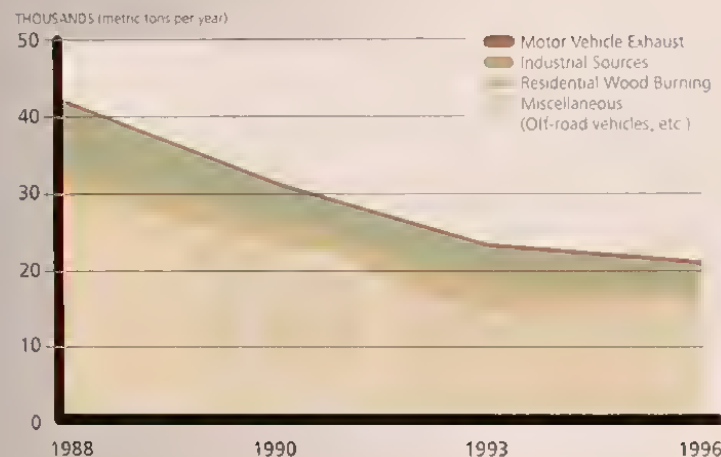


Citizen committees also developed control strategies for residential wood burning. These strategies focused on the reduction of woodstove emissions, which assisted in the control of carbon monoxide and particulate matter. A great deal of public involvement contributed to effective strategies that restricted woodstove burning during air stagnation alerts. Another effective measure was Local Rule 1428, which regulates the types of wood stoves that can be owned and operated in restricted areas. After receiving approval from state and local government agencies, EPA approved these SIP control strategies in 1986. The control strategies brought carbon monoxide concentrations down, but not enough to rid Missoula of its nonattainment designation.

Carbon monoxide and particulate matter have both been problem pollutants for the Missoula committee. Transportation sources, residential wood burning, and severe winter temperature inversions have all contributed to the area's pollution problems.

Missoula Carbon Monoxide Estimated Annual Emissions

1988–1996



Oxygenated Fuel Control Area



The figure shows first and second highest eight-hour ambient levels at the intersection of Russell Street, Brooks Street, and South Avenue (Malfunction Junction) from 1988 through 1996.

Because of its nonattainment status, Missoula was required by the 1990 Clean Air Act Amendments to develop an oxygenated fuels program. Oxygenated fuels have either alcohol-based or ether-based fuel additives that increase the oxygen content of gasoline, allowing for a cleaner burn. Missoula identified an Oxygenated Fuel Control Area where gas stations were required to sell “oxy-fuels” during the months of November, December, January, and February, because these are the months Missoula experiences the worst carbon monoxide impacts. Missoula and the surrounding communities of Lolo to the south, Bonner/Milltown to the east, and the intersection of U.S. Highways 93/200 with Interstate 90 to the northwest are included in the Oxygenated Fuel Control Area. Since 1993, the first full year that oxy-fuels were available, carbon monoxide ambient impacts have declined below the standard. This decline is a direct result of Missoula’s oxy-fuel program.

Missoula has been compliant with all state and federal air quality standards since 1993 and is considering taking the first step toward having its carbon monoxide nonattainment status lifted. To do so, the citizens of Missoula will have to adopt a maintenance plan with DEQ assistance that would keep them in compliance with the carbon monoxide standard. Missoula and other valley communities must take special care of their airsheds due to the frequency and severity of winter inversions.



Emissions

EPA realized it would be difficult to significantly reduce pollution from motor vehicles unless fuels were cleaned up. The 1990 Clean Air Act made several provisions for cleaning up fuel. Lead was removed completely from gasoline in 1995, and diesel fuel now contains less sulfur, which contributes to acid rain and smog. Gasoline refineries have reformulated gasoline that is sold in the country’s smoggiest areas to contain fewer volatile organic compounds, such as benzene, which is a hazardous air pollutant that causes cancer. In inversion-prone areas like Missoula, people starting and idling their cars in winter increase carbon monoxide pollution. In these areas, oxy-fuel (gasoline with oxygen added to make the fuel burn more efficiently) reduces carbon monoxide and particulate emissions. Today, all gasoline contains detergents that prevent build-up of engine deposits to keep engines working smoothly and the burning of fuel clean and more efficient.

Ethanol

Also called grain alcohol, ethanol is produced in the United States from the fermentation of grains, sugars, cellulose, agricultural waste products, or from ethylene, a derivative of the oil refining process.

Ethanol is used in fuels for motor vehicles to increase the oxygen content of the fuel so that it burns more completely in the engine, reducing tailpipe emissions, especially of carbon monoxide. Ethanol is also used to increase the octane rating of gasoline. Ethanol-blend gasoline when composed of 10 percent ethanol to 90 percent petroleum gasoline is called gasohol or sometimes E-10 and is sold commercially in many fuel stations in Montana and the rest of the country.

Ethanol-blend (E-10) or gasohol has the advantage of requiring no engine modifications. It also can slightly increase power over petroleum gasoline. Use of ethanol-blend (E-10) fuel reduces carbon monoxide emissions from a car's engine by 5-15 percent.

Vehicles are also available that will burn ethanol at a higher blend rate than 10 percent. These vehicles, called alternative fuel vehicles or AFVs, are available to fleets and the public from major manufacturers. These AFVs are equipped with a fuel sensor and other modifications which allow them to run on any blend from 85 percent ethanol/15 percent petroleum gasoline (E-85) to 100 percent conventional petroleum gasoline.

A disadvantage is that ethanol is often more

expensive to produce than petroleum gasoline. Incentives at the federal and state level reduce the cost of the fuel to consumers.

Ethanol is used as an octane enhancer when local production makes it competitive to alternatives, such as MTBE (methyl tertiary butyl ether), which may be imported or transported long distances. Ethanol is produced in the U.S. and does not have some of the impacts of alternatives like MTBE such as contamination of groundwater.

Another disadvantage of ethanol-blend is that it acts as a solvent in the fuel system, cleaning out deposits. In newer vehicles with fewer miles this does not represent a problem. In older vehicles with many miles this may mean changing the fuel filter more frequently or other problems.

Buy Ethanol-Blend or Gasohol

1. Ethanol-blend or gasohol is available in many of Montana's major cities and also in many smaller communities.
2. Ethanol-blend or gasohol sold in Montana is often made from grain grown in the state by Montana farmers and ranchers.
3. Ethanol is a renewable resource and using ethanol blend in your vehicle supports our local and regional economy while helping to keep our air clean.

Alternative Fuels and Vehicles

Besides alternative fuel vehicles (AFVs) that can run on a high blend of ethanol there are vehicles that run on other alternative fuels including natural gas, electricity, biodiesel, and methanol. Federal legislation requires federal and many state government and major utility fleets to include a certain percentage of new vehicles purchased to be AFVs. Legislation by California and Arizona require an increasing number of new vehicles sold each year in the state to be low or very low emission vehicles. The emission requirements usually can only be met by AFVs. As vehicle production increases, costs are coming down and technology is improving rapidly. Since the field is so dynamic, individuals and fleet managers interested in AFVs should contact their local vehicle dealer or the manufacturer's main office or check with some of the offices/websites listed in the back of this publication for the most current information on models and features available.

MANAGING, MAINTAINING, AND IMPROVING MONTANA'S AIR QUALITY

Montana's Current Air Quality Status

Montana is a large state (145,556 square miles) with a small population (879,372 from the 1996 estimate, U.S. Bureau of the Census). Air quality problems in Montana are usually related to urban areas and mountainous topography or river valleys that are sensitive to temperature inversions. Particulate matter and carbon monoxide are the criteria pollutants that have the greatest adverse impact on Montana's air quality. Particulate matter generally comes from vehicles traveling on unpaved roads,

sand and gravel from winter traction material, and residential wood burning. Carbon monoxide comes primarily from motor vehicles and residential wood burning. Although industrial sources account for only a small part of carbon monoxide and particulate matter emissions in most communities, industries are the main sources of sulfur dioxide and lead pollution in Montana.

Montana has 14 areas that have exceeded the air quality standards for carbon monoxide, lead, particulate matter, and/or sulfur dioxide. DEQ monitors each of these pollutants in nonattainment areas. In addition, DEQ has monitored for ozone in Billings, Butte, and Anaconda as a reaction to concerns that rapid population growth in these areas could cause ozone problems.

In total, DEQ operated 34 monitoring sites in 1998. Some of these sites collected data for more than one pollutant: 20 collected particulate matter, eight collected carbon monoxide, two collected sulfur dioxide, four collected lead, and six served as meteorological monitoring sites. Many county governments and private industries operate their own monitoring stations throughout the state. Each year, DEQ reviews its monitoring network to determine if monitoring at sites should be expanded to include additional pollutants, partially or completely discontinued, or moved to a new site within the community with known or suspected air quality infringements.

In response to the new national ambient air quality standards for PM-2.5, DEQ has established





An air quality specialist reviews data from the new PM-2.5 samplers at Lockwood Park in Billings. New samplers have also been installed at locations in Butte, Helena, Kalispell, Libby, Missoula, and Whitefish.

eight new PM-2.5 monitoring locations in Billings, Butte, Helena, Kalispell, Libby, Missoula (two sites), and Whitefish. Additional PM-2.5 samplers will be installed at Belgrade, Great Falls, Hamilton, and Thompson Falls in 1999. In many cases, county air quality and health staff will operate these sites.

Criteria pollutant emissions from industries continue to fluctuate across Montana, but pollution control strategies in nonattainment areas have improved air quality since 1986. PM-10 monitoring data from Butte, Columbia Falls, Missoula, and Thompson Falls shows improvements in air quality. Sulfur dioxide levels in Billings also show a strong downward trend toward improved air quality. The only lead nonattainment area in Montana is East Helena. Ambient lead levels there have fluctuated over the years but have shown a recent decrease. Maintaining improvements in air quality poses a challenge to the state as new industries open and Montana's population continues to grow.

Montana Department of Environmental Quality Activities and Solutions

DEQ and local air pollution control agencies administer the state's air quality program, which includes six general areas:

- permits;
- inspections and enforcement activities;
- implementation plans;
- air quality monitoring;
- confidential site assessments; and
- technical compliance and pollution prevention assistance.

The combination of these activities provides Montanans with a coordinated and comprehensive program of public education, monitoring, pollution prevention, problem correction, and enforcement.

In order to prevent future air quality problems, Montana relies primarily on its permitting program

to meet the requirements of the federal Clean Air Act Amendments of 1990. This program requires all significant sources of air pollution to obtain a permit prior to construction. Montana requires a permit for any source that may emit more than 25 tons per year of any criteria air pollutant (except lead, which has a cap of five tons per year). Montana's permitting program has EPA approval and operates in lieu of a federal program.

DEQ has a Small Business Ombudsman (SBO) and a Small Business Assistance Program (SBAP) to provide free and confidential help to small business stationary sources of air pollution like automobile refinishing shops, dry cleaners, chromium electroplaters, printers, and small manufacturers. Even though emissions from these businesses are small when compared to large facilities, they can affect human health and the environment with acute releases or with their cumulative impacts in urban areas. The SBO is responsible for helping these businesses understand the environmental regulations that affect them and for making sure that new regulations are effective and fair. The SBAP provides technical assistance to small businesses with regard to their pollution prevention options, permits, and control technologies.

One of the most difficult tasks in air pollution control is to bring areas that exceed air quality standards back into compliance. DEQ works with communities and industries to develop individualized control plans to ensure compliance with all standards. All of these plans, permit rules, and emission standards are known collectively as the SIP. SIP preparation and revision is an immense and ongoing effort that requires public input and, in the end, has a profound effect on Montana communities and industries.

Montana's air quality program will continue to focus on SIP development and Clean Air Act Amendment requirements.

Ambient air quality monitoring is an important part of any air quality monitoring program, and DEQ operates 34 monitoring stations throughout Montana with a focus on known or suspected problem areas. Numerous industries also operate monitoring stations around the state as part of the PSD program. Efforts will continue to focus on PM-10 and other nonattainment area monitoring requirements.

DEQ has developed an industrial inspection program in which department staff visit industries and assess the level of compliance with SIP requirements, emissions standards, and permit conditions. DEQ works closely with these industries to solve any problems. DEQ handles each violation on a case-by-case basis and follows a State/EPA Enforcement Agreement. If violations are found, enforcement actions may include:

- requests for voluntary compliance;
- hearings before the Board of Environmental Review;
- notices of Violation and Order to Take Corrective Action; and
- civil or criminal penalties.

Who Does What?

The 1990 Clean Air Act is a federal law that covers the entire country, ensuring that all Americans have the same basic health and environmental protections. Under this law, EPA sets limits on how much of a particular pollutant can be in the air anywhere in the United States. The states, how-



The main offices of Montana's Department of Environmental Quality are located in the Lee Metcalf Building, 1520 E Sixth Ave , Helena 59601

ever, do much of the work to carry out the provisions of the Act. The law allows individual states to have more protective ambient air standards, but they are not allowed to have less stringent standards than those set by EPA for the whole country. The 1990 Clean Air Act also gives important new enforcement powers to EPA. It enables EPA to fine violators, much like a police officer giving traffic tickets.

Within Montana, the Clean Air Act of Montana allows the development of local air pollution control programs. With DEQ assistance, these

programs handle the development of control strategies for nonattainment areas that need SIPs, as well as permitting of smaller sources. Montana's state government still issues permits to large air pollutant sources located within the jurisdiction of local air pollution control programs. The State of Montana does not have jurisdiction over air quality matters on tribal lands. Each tribal authority, with the help of EPA, develops an air quality control program to control emissions on reservation lands. (See page 7 for a summary of federal Clean Air Act regulations.)

FUTURE CHALLENGES IN MONTANA

How Montana communities manage growth and approach development decisions they make in the next few decades will have an important impact on the future of air quality. As the state approaches a population of one million, counties will face new and challenging issues. Between 1990 and 1996, Montana's population increased by 10.1 percent. As

of 1996, high-growth counties were generally located in western Montana, where growth rates were as follows: Flathead (20 percent), Gallatin (20 percent), Lake (18 percent), Ravalli (34 percent), and Sanders (17 percent). Other rapidly growing counties included Carbon (15 percent), Broadwater (21 percent), Jefferson (22 percent), and Yellowstone (11 percent). With this population growth, Montana can anticipate air quality impacts from increased transportation and land use demands. Of the 17 ambient air quality nonattainment areas in Montana, 13 of them are located in counties that have experienced more than a 12 percent growth rate. Communities can use planning for growth to minimize adverse impacts to air quality.

Fine Particulate Matter

Recent revisions to the federal air quality standards and the Regional Haze Rule include an emphasis on fine particulate matter. PM-2.5 is primarily the result of industrial burning, tailpipe emissions, and smoke from open and prescribed burning and wood stoves. The new PM-2.5 air quality standard will emphasize control measures for these sources. Because total industrial activity in Montana has not changed substantially in recent years, PM-2.5 emissions from existing industries will continue to be addressed through the permit review and/or the SIP processes.

Working with the Montana Department of Transportation, DEQ is trying to create air quality



programs that focus on lowering vehicle emissions and people's reliance on vehicles. By promoting alternative transportation such as walking, bicycling, and mass transit, Montana's citizens and tourists can reduce transportation's impact on air pollution. Mobile sources produce 80 to 90 percent of all area source emissions including particulate matter, carbon monoxide, and precursors to ozone. Even though today's vehicles produce about 10 times less pollution than models available 25 years ago, the increase in the number of vehicles on Montana's roads and highways will offset these emission savings. If gasoline remains relatively inexpensive, Montanans and their visitors can be expected to continue to drive more often, for longer distances, and with only one person per vehicle, putting the future of Montana's air quality at risk.

The current land use development trend is to spread out, which creates a phenomenon known as suburban sprawl. This kind of development requires large amounts of land and infrastructure, creating traffic congestion, construction of more paved and unpaved roads, and other threats to air quality. DEQ continues to encourage land uses that let people walk or use mass transit, rather than relying on their cars for mobility. This includes supporting central business district developments instead of suburban sprawl and supporting higher density housing in downtown areas, which reduces people's commute to work and shop. If just one-half of the expected new growth in Montana were more compact, developments would require at least 25 percent less land. Higher density developments are easier to connect with mass transit and encourage people to walk or bicycle to their destinations. These strategies have

other benefits, including fewer vehicle expenses, lower infrastructure costs, and more diverse and affordable housing.

Other air quality concerns in Montana involve open and prescribed burning. Many federal, tribal, and state forestry managers plan to increase the use of fire to create resource benefits on public lands. Many forest ecosystems are unhealthy as a result of past management strategies that prevented wildfires. Although open and prescribed burning can benefit forests and lower the risk of wildfires, a natural by-product of any burning is smoke. Because smoke is primarily made of particulate matter that is harmful to human health and impairs visibility, this trend will have an adverse effect on Montana's air quality. Because of the long transport distance of smoke as it drifts between state and national boundaries, control efforts are difficult. Open and prescribed burning in Montana can adversely affect neighboring states, just as similar circumstances in neighboring states can affect Montana's air quality.



In addition to open and prescribed burning, smoke from accidental fires, such as this recent fire in Helena, can release large amounts of harmful particulate matter in a short period of time

CITIZEN PARTICIPATION

Personal Involvement

Air pollution comes from many sources, and all of us who live in Montana contribute directly or indirectly to air pollution in our daily activities. Fortunately, there are many simple ways to reduce our contribution to air pollution and actually promote clean air. Since automobiles are a major source of air pollution in most areas, driving habits and car maintenance can either add to the problem or help to solve it. The following suggestions can help reduce air pollution.

Driving Tips

■ **Plan Ahead:** Organize trips and combine errands when possible. Avoid driving during peak traffic periods when stop-and-go traffic is at its worst. This not only saves time and gas, but it also reduces wear and tear on vehicles.

■ **Use Non-Motorized Travel:** Try walking or bicycling for short errands, commuting to work or school if you live close enough, and for recreation. Walking and bicycling not only reduce air pollution, but also are good for your health. Research shows that regular walking or bicycling reduces stress, helps with weight control, and reduces the risk of heart disease, osteoporosis, and other chronic illnesses.

■ **Drive Fuel Efficient Cars:** Look for the most fuel efficient cars or trucks when buying a vehicle.

■ **Avoid High Speeds:** Doubling a vehicle's speed quadruples the air resistance. For every mile-per-hour (mph) over 55, the average car or truck loses almost two percent in gas mileage. The emissions have been found to greatly increase over 65, because the emissions control systems were designed for flow rates of 55-60 miles per hour. Driving at high speeds also causes heat build-up and unnecessary tire wear.

■ **Drive Smoothly:** It is more fuel efficient to drive at a constant speed than it is to slow down and speed up. Using cruise control can improve highway performance.





Myth:

Vehicle performance declines when operating emission control devices.

Fact:

Well-maintained vehicles and engines operate more efficiently, have better performance, and better gas mileage. Modern vehicles are designed to operate with emission control devices, and disabling the emission control devices generally results in poorer vehicle and engine performance.



Maintaining vehicles is one of the easiest ways to improve air quality in Montana. Regular tune-ups, proper fuel consumption, and thoughtful driving practices can all reduce the effects of vehicle-related pollutants.

■ **Stop and Start Evenly:** Gently accelerating reduces gas consumption. Coasting to a stop allows the driver to use the car's momentum, not its fuel.

■ **Don't Idle the Engine Unnecessarily:** When stopping for more than one minute, it's more fuel efficient to turn off a vehicle and restart it than to idle for the duration. When stopped by trains, drive-through windows, or waiting for a passenger, don't idle the engine, turn it off.

■ **Travel Light:** Don't carry unnecessary items in the vehicle. The more weight a vehicle carries, the more fuel it burns. At the end of winter, remember to remove extra weight placed over tires for improved traction in snow and ice.

Operation and Maintenance of Vehicles

■ **Don't Overfill or "Top Off" the Gas Tank:** Even without spilling gasoline, fumes can escape.

■ **Follow Manufacturer's Octane-Level Recommendation:** Although some turbo-charged and high performance vehicles require high-octane fuel, using it in other vehicles does not necessarily improve engine performance. The use of higher-octane gasoline than an engine needs drives up the demand for this fuel and increases air pollution because the manufacture of higher-octane gasoline produces more pollutants than lower octane. When high-octane fuels are desired, choose ethanol blends that increase octane without increasing emissions.

■ **Get Regular Engine Tune-ups and Car Maintenance Checks:** Tune-ups improve gas mileage and car performance. Spark plugs are especially important because a worn spark plug will cause poor starting and rough idling, which reduce gas mileage.

■ **Use the Air Conditioner Wisely:** At vehicle speeds less than 35 mph, operating an air condition-

er can reduce gas mileage up to 20 percent. If the car interior needs cooling at speeds less than 35 mph, roll down the windows. Above 35 mph, the air conditioner is more energy efficient in newer cars.

Reducing Air Emissions at Home and Work

One source of air pollution is the manufacturing of products for consumers. Transporting these products to market also contributes to air pollution. Consumers can reduce air pollution by selecting products that are manufactured close to home and require less energy to produce and transport. Most consumers can implement the following suggestions to help reduce air pollution.

■ **Conserve Electricity:** Coal-fired power plants contribute to air pollution in Montana and the

nation. Conserving electricity reduces the amount of coal that is burned and consequently the air pollution.

■ **Conduct an Energy Audit of Your Home:** Contact your local utility to schedule an energy audit of your home and act on recommendations to improve energy efficiency. Or, conduct your own energy audit using the Energy Star Software available from the Lawrence Berkeley Laboratory on the Department of Energy web site listed in the back of this publication.

■ **Use Compact Florescent Light Fixtures:** Replace incandescent light bulbs with compact florescent lamps. Compact florescent lamps use about one third of the energy to provide the same amount of light as incandescent bulbs and last much longer. While more expensive to purchase, compact florescent lamps pay for themselves in energy savings over the life of the lamp. Visit the Lighting Design Lab web site for more recommendations.

■ **Purchase Appliances that are Energy Efficient and Built to Last:** Large appliances including refrigerators, freezers, dishwashers, water heaters, washers, and dryers are labeled with information on energy efficiency. Look for bright yellow labels or Energy Star labels and use them to compare energy efficiency. Consider the expected useful lifetime of the appliance, the environmental cost of disposing of it and replacing it, with the cost of purchase. Visit the Energy Star web site for specific information.

■ **Purchase Efficient Equipment:** Purchase computers, copiers, motors, power tools and other equipment that are efficient to operate and designed for the task at hand. Look for Energy Star labeling

on computers that indicate if the models are designed to "sleep" or use less energy when they are on, but not in use.

■ **Reduce, Reuse, then Recycle:** Follow the hierarchy of first reducing wastes at the source, then reusing goods, and finally recycling. Reducing wastes at the source includes not purchasing or accepting items that are not needed and selecting goods with minimal packaging. Reuse what is available before purchasing new products and provide used items to others that can reuse them. Source reduction and reuse are more beneficial to the environment than recycling because they reduce the energy and resources used in production and eliminate the need to recycle or dispose of the product or packaging.

■ **Turn Equipment Off When Not In Use:** Much of the equipment in use today uses energy when it is idle. A computer monitor uses 60 watts of power and screen savers don't reduce consumption. Turn off computer monitors when away for more than 10 minutes. Turn off other equipment at home and in the office when leaving at night.

■ **Recycle:** Recycle materials including glass, aluminum and other metals, wood, paper including corrugated and flat cardboard, and plastics. White and computer paper can be recycled; in larger communities, pastel colored paper can be recycled. Recycling these materials cuts down on the amount of pure materials mined or manufactured, and helps to reduce air pollution from processing facilities. Consider the recycling opportunities locally available to reduce transportation to recycling markets.

■ **Buy Recycled:** An important part of recycling is



Residential wood burning is one of the major contributors to air pollution in Montana. Operating wood stoves only when necessary and burning only dry wood can help reduce the negative impacts of residential burning.

to buy recycled products. In order for there to be recycling opportunities, there must be a market for goods produced with recycled materials.

■ **Reduce Household Hazardous Wastes:**

Hazardous materials are included in some products used in the home, including paint, varnish, paint thinner, oven cleaners, batteries, and yard and garden chemicals. Consumers should be careful to purchase only what is needed and check whether local sanitation services provide disposal and recycling. Invest in a charger and switch to rechargeable batteries.

■ **Properly Dispose of Used Oil and Leftover Paint:**

Do not pour oil onto the ground or down sewer systems. Check with the local sanitation service for collection and recycling of unwanted paint. Take used automotive oil to a service station or recycling center.

■ **Properly Dispose of Refrigeration and Air Conditioning Equipment:**

Contact the local trash pickup service to find out about proper disposal of this equipment. Federal law prohibits the release of refrigerant during the disposal of refrigeration and air conditioning equipment.

■ **Operate Woodstoves and Fireplaces Sparingly:**

Operate a woodstove only when necessary and always according to the manufacturer's recommendations to improve burning efficiency. Burn only dry well-seasoned, stacked and covered wood. Stored wood loses about 5 percent of its energy for heat content per year, so wood should not be stored for too long.

Influence Local Business

Consumers can influence air pollution from local businesses by requesting processes that are less polluting. Businesses respond to consumer requests when they can and will often provide services that customers request. Use your purchasing power to patronize businesses that prevent pollution.

■ **Request Non-hazardous Service Station Practices:**

Check to make sure that your service station uses non-hazardous solvents, recycles antifreeze and refrigerant, and reuses or recycles used oil.

■ **Patronize Body Shops That Reduce Emissions and Waste:**

Make sure the body shop you take your car to uses an enclosed, ventilated, filtered spray booth, low-VOC coatings, re-mixes and reuses waste coatings, and recycles thinner.

■ **Request Minimal Solvent in Dry Cleaning:**

Make sure your dry cleaner uses a machine that does not vent solvents into the atmosphere.

■ **Request Water or Soy-based Printing Inks:**

Make sure your printer offers non-hazardous ink alternatives such as water or soy-based inks to help cut down on VOC emissions. Request these inks be used on printing jobs for your organization or business.

■ **Issues and Recommendations for Two-Cycle Engines:**

Two-stroke engines are used in lawn mowers, leaf blowers, snowmobiles, all-terrain vehicles, and personal watercraft. These two-stroke engines, by current design, emit 20 to 33 percent of their fuel unburned. Almost all the engine lubrication oil is emitted unburned, usually seen as smoke. These engines are desirable in certain applications because they are less expensive than four-stroke engines and

provide a high power-to-weight ratio, but they have a large impact on air quality. Two-stroke engines are calibrated to run rich for smooth engine response, resulting in high emissions of carbon monoxide (CO) and unburned hydrocarbon (HC). For example, data from a gasoline-powered lawn mower indicate it can emit as much in one hour of operation as produced by an average automobile during 3,000 miles of travel.

At this time, EPA does not yet regulate these engines, but announced in January 1999 a proposal to regulate them in the near future.

■ **Consider Alternatives to Gasoline Engines and Conventional Petroleum Products:**

Use a manual or electric-powered tool. If a gasoline engine must be used, consider using ethanol-blend fuel and low-emission synthetic lube oil to minimize emissions.

■ **Make Your Snow Machine More Environmentally Friendly:**

- use proper jets, keep engines tuned and clutches adjusted properly for the elevation where machines operate;
- use oxygenated fuels such as 10 percent ethanol blend to reduce pollution;
- use synthetic low-particulate lube oils to reduce particulates and smoke; and
- use synthetic biodegradable lube oils to reduce potential water pollution.

Check with your dealers, outfitters, and/or retailers for availability of these and similar reduced-emission products.

Who to contact for more information

Montana DEQ Main Office

1520 E. 6th Ave.
Helena, MT 59601

Montana DEQ Satellite Office

2209 Phoenix
Helena, MT 59601

Automobile Emissions	406-444-3629
Burning Restrictions	406-444-0285
Carbon Monoxide	406-444-3658
Clean Air Act	
State and Federal Ambient Standards	
and State Implementation Plan	406-444-7305
Permitting and Emission Limits	406-444-4114
Complaints, Investigation,	
and Enforcement	406-444-0379
Compliance Assistance, Rules, Permits	406-444-4114
Data Management	
AIRS - Air Quality Data	
Management System	406-444-5330
AFS - Air Facility Data	
Management System	406-444-5279
De-Icers (chemical)	406-444-3658
Emergency Response	
Hazardous Materials Emergency	
Response Team	406-841-3911
Emissions, Air	
Industrial Sources	406-444-0284
Continuous Emission Monitoring	
(CEM)	406-247-4448
Source Inventories, Listings	406-444-5279
Source Testing	406-444-5280
Field Offices	
Billings	406-247-4448
Missoula	406-523-4907

Forest Fires

Report to Department of Natural	
Resources and Conservation	406-542-4300
Smoke, Air Quality Standards	406-444-7305
Health and Environmental Impacts	
of Air Pollutants	406-444-7305
Incinerators - Hazardous/Non-Hazardous	
Waste	406-444-0286
Indoor Air Quality	406-444-6768
Lead	406-444-3403
Methane/Landfills	406-444-0286
Modeling and Analysis - Dispersion Modeling, Emissions	
Inventories,	
Meteorological Analysis	406-444-5272
Monitoring and Assessment	406-444-5320
Nitrogen Oxides	406-444-3658
Open Burning	406-444-0285
Smoke Management Hotline	
(Sept. 1 - Nov. 30)	800-225-6779
Oxygenated Fuel	406-444-3658
Ozone	406-444-3658
Particulates - Road Dust, Wood Stoves, Tail Pipe	
Emissions, Industrial	406-444-3658
Permits	406-444-4114
Small Business Air Quality	406-444-2960
Pollution Prevention	406-444-6749
Regional Haze	406-444-7305
Road Dust	406-444-3658
Small Business Air Quality Assistance	406-444-2960
Small Business Assistance Hotline	800-433-8773
Snowmobile Emissions	406-444-6773
Standards and Rules	406-444-7305
State Implementation Plans	406-444-7305
Sulfur Dioxide	406-444-3403
Vehicle Emissions	406-444-0346
Wood Stoves - Emissions, Regulations,	
Surveys	406-444-3629
Wood Stoves	406-444-3629

Local Government Air Quality Programs

Butte/Silver Bow Health Department

25 W. Front St.
Butte, MT 59701
(406) 723-3274
contact: Paul Riley
email: par@in-tch.com

Cascade County Health Department

115 4th St. S.
Great Falls, MT 59401
(406) 454-6950
contact:: Brian Clifton

Flathead County Health Department

723 5th Ave. E.
Kalispell, MT 59901
(406) 758-5760
contact: Richard Quist
email: dquist@co.Flathead.mt.us

Lewis and Clark City/County Health Department

Environmental Division

316 N. Park
P.O. Box 1723
Helena, MT 59624
(406) 447-8351
contact: Frank Preskar
email: preskar@co.lewis-clark.mt.us

Lincoln County Health Department

418 Mineral Ave.
Libby, MT 59923
(406) 293-7781, ext. 220
contact: Kendra Lind
email: klind@libby.org

Missoula City/County Health Department

301 W. Alder
Missoula, MT 59802
(406) 523-4755
contact: Ben Schmidt
email: bschmidt@co.missoula.mt.us

Yellowstone City/County Air Pollution Control

3306 2nd Ave. N.
Billings, MT 59101
(406) 256-6841
contact: Steve Duganz
email: ycape@imt.net

EPA Headquarters:

United States Environmental Protection Agency
401 M St. SW
Washington, DC 20460
(202) 260-2090

Montana State University Extension Service:

Pollution Prevention Program
Bozeman, MT 59717
(406) 994-3451
(888) 678-6872

EPA Regional Office:

United States Environmental Protection Agency—
Region VIII
999 18th St.
Suite 500
Denver, CO 80202-2405
(303) 312-6312
(800) 227-8917

EPA State Office:

United States Environmental Protection Agency—
Region VIII
Montana Office
301 S. Park
Drawer 10096
Helena, MT 59626-0096
(406) 441-1123

Air Quality Related Interest Groups

- American Lung Association (406) 442-6556
- Environmental Defense Fund (800) 684-3322
- Montana Audubon (406) 443-3949
- Montana Environmental Information Center (406) 443-2520
- Montana Mining Association (406) 443-7297
- Montana Petroleum Association (406) 442-7582
- Montana Wood Products Association (406) 443-1566
- Northern Plains Resource Council (406) 248-1154
- Sierra Club (415) 977-5653
- Western Environmental Trade Association (WETA) (406) 443-5541
- Yellowstone Valley Citizen Council (affiliate of the Northern Plains Resource Council) (406) 248-1154

Internet Sites of Relevant Information

Government Organizations

- Airlinks Internet Address:
<http://www.epa.gov/airlinks/>
- Alternative Fuels Data Center:
<http://www.aafdc.doe.gov/>
- California Air Resources Board (includes buyer's guide to clean cars): <http://www.arb.ca.gov/homepage.hrm>
- Center for Environmental Information and Statistics (CEIS): <http://www.epa.gov/ceisweb/index.html>
- Center for Excellence in Sustainable Development:
<http://www.sustainable.doe.gov/>
- Montana DEQ Internet Address:
<http://www.deq.state.mt.us>
- The Plain English Guide to the Clean Air Act:
http://www.epa.gov/oar/oaqps/peg_caa/pegcaain.html
- South Coast Air Quality Management District:
<http://www.aqmd.gov/>
- State and Territorial Air Pollution Program Administrators, and Association of Local Air Pollution Control Officials (STAPPA & ALAPCO):
<http://www.4cleanair.org/>
- Western States and Air Resources Council:
<http://www.westar.org/>
- United States Environmental Protection Agency (EPA): <http://www.epa.gov/>
- ◆ Envirofacts Warehouse:
http://www.epa.gov/enviro/index_java.html
- ◆ Office of Air Quality Planning and Standards, Technology Transfer Network:
<http://www.epa.gov/ttn/>

- ◆ Office of Air Quality Planning and Standards:
<http://www.epa.gov/airs/airs.html>
- ◆ Office of Air Quality Planning and Standards - AIRNOW (real-time data):
<http://www.epa.gov/airnow/>
- ◆ Office of Air Quality Planning and Standards - AIRSDATA: <http://www.epa.gov/airsdata/>
- ◆ Office of Air and Radiation: <http://www.epa.gov/oar/>
- ◆ Small Business Assistance Program:
<http://www.epa.gov/ttn/SBAP/>
- ◆ Small Business Ombudsman:
<http://www.epa.gov/sbo/>

Environmental Organizations

- Air and Waste Management Association (AWMA):
<http://www.awma.org/>
- Western States and Air Resources Council:
<http://www.westar.org/>

Educational Resources

- American Lung Association of Washington:
<http://www.alaw.org/>
- The Environmental Education Network:
<http://www.envirolink.org/enviroed/>
- National Consortium for Environmental Education and Training, NCEET Environmental Education Toolbox:
<http://www.eelink.net/sitemap.html>

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Air Pollution Engineering Manual, Buonicore, Anthony J., and Wayne T. Davis (eds.), Air and Waste Management Association. New York, New York, 1992.

An Overview of Air Quality in Missoula, Montana, Missoula City/County Health Department, Missoula, Montana, 1989.

Emissions from Snowmobile Engines Using Bio-Based Fuels and Lubricants Final Report, Jeff J. White, James N. Cartoll, and Howatd E. Haines, Montana Department of Environmental Quality, Helena, Montana, 1998.

Environmental Impact Statement, Montana Ambient Air Quality Standards, Montana Department of Health and Environmental Sciences, Air Quality Bureau, Helena, Montana, 1980.

Montana Air Quality Data and Information Summary for 1979-1980, Montana Department of Health and Environmental Sciences, Air Quality Bureau, Helena, Montana, 1981.

Montana Air Quality Data and Information Summary for 1981, Montana Department of Health and Environmental Sciences, Air Quality Bureau, Helena, Montana, 1981.

Montana Air Monitoring Network Review, Montana Department of Environmental Quality, Monitoring and Data Management Bureau, Helena, Montana, 1998.

Montana Quality Assurance Project Plan, Montana Ambient Air Monitoring Program, Montana Department of Environmental Quality, Monitoring and Data Management Bureau, Helena, Montana, 1997.

State/EPA Agreement, Montana Department of Environmental Quality, Resource Protection Planning Buteau, Helena, Montana, 1996.

The Clean Air Act Amendments of 1990, Environmental Protection Agency, Summary Materials, 1990.

National Air and Radiation Indicators, National Air and Radiation Indicators Project, Washington, D.C., 1997.

APTI Course 435, Atmospheric Sampling, Student Manual, EPA 450/2-80-004." United States Environmental Protection Agency, Office of Air and Radiation. Washington, D.C., 1980.

What You Can Do To Reduce Air Pollution, EPA-450-K-92-002, United States Environmental Protection Agency, Office of Air and Radiation, Washington, D.C., 1992.

Your Car (or Truck) and the Environment, EPA-420-K-93-001, United States Environmental Protection Agency, Office of Air and Radiation, Washington, D.C., 1993.

Brochure on National Air Quality: Status and Trends, EPA-454/F-98-006, United States Environmental Protection Agency, Office of Air and Radiation, Washington, D.C., 1998.

EPA Regional Approaches to Improving Air Quality, EPA-451-K-97-001, United States Environmental Protection Agency, Office of Air and Radiation, Washington, D.C., 1997.

New Source Review Workshop Manual-Draft, United States Environmental Protection Agency, Air and Waste Management, Washington, D.C., 1990.

The Plain English Guide to the Clean Air Act, EPA-400-K-93-001, United States Environmental Protection Agency, Office of Air and Radiation, Washington, D.C., 1993.

GLOSSARY

Acidification— The process by which rivers, lakes, rain, and other natural features become affected by excess acid. Nitrogen dioxide may form toxic organic nitrates, which contribute to acid rain and the acidification of ground and surface water.

Air Toxics— Air toxics include any air pollutant for which a National Ambient Air Quality Standard does not exist (i.e., excluding ozone, carbon monoxide, PM-10, sulfur dioxide, and nitrogen oxide) that may reasonably be anticipated to cause cancer, developmental effects, reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Ambient Air— The portion of the atmosphere, external to buildings, to which the public has access.

Ambient Air Quality— A physical and chemical measure of pollutant concentrations in the ambient atmosphere. The quality is usually determined over a specific time period.

Attainment Area— A geographic area in which levels of a criteria air pollutant meet the health-based primary standard (National Ambient Air Quality Standard, or NAAQS) and the environmentally based secondary standards for the pollutant. A single area could be designated attainment for one pollutant and nonattainment for another. Attainment areas are defined using federal pollutant limits set by EPA.

Best Available Control Technology (BACT)— An emission limit based on the maximum degree of reduction for each pollutant regulated by the Clean Air Act. The per-

mitting authority, taking into account energy, environmental and economic impacts determines what emission limits facilities should achieve in an attainment area on a case-by-case basis by considering production processes and available methods, systems, and techniques.

British Thermal Units (BTUs)— The amount of heat necessary to increase the temperature of one pound of water one degree Fahrenheit at a specified temperature.

Carcinogenic Substances— Cancer-causing substances.

Cardiovascular— Pertaining to or involving the heart and blood vessels.

Chemical Mass Balance— A modeling technique to identify and quantify the emission sources of particulates present in an area of interest.

Clean Air Act— A law enacted by Congress to protect and enhance the quality of the nation's air resources, promote public health and welfare, and enhance the productive capacity of its population.

Criteria Air Pollutant— A pollutant for which EPA has established a National Ambient Air Quality Standard under Section 109 of the Clean Air Act. Present criteria pollutants include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter equal to or smaller than 10 microns (PM-10), fine particulate matter smaller than 2.5 microns (PM-2.5), and sulfur dioxide.

Department of Environmental Quality (DEQ)— The department within the State of Montana government that regulates pollution to the air, water, and land.

Dispersion— The action of the atmosphere that mixes an ambient air pollutant, thereby reducing the concentration.

Environmental Protection Agency (EPA)— The federal government agency that regulates pollution to the air, water, and land.

Hydrocarbons— Compounds composed of carbon and hydrogen atoms.

Inversion— A meteorological condition in which the temperature of the atmosphere rises with increased elevation instead of falling, creating a stagnant layer of air near the ground.

Lowest Achievable Emission Rate (LAER)— A requirement applying to proposed new or modified major stationary sources of pollution in nonattainment areas. LAER means the "rate of emissions that reflect the most stringent emission limitation contained in the SIP of any state for such class or category of source or the most stringent emission limitation which is achieved in practice . . . whichever is more stringent."

Meteorological Conditions— Atmospheric weather conditions such as wind speed, wind direction, temperature, and atmospheric stability (mixing of the air).

Micron— Also referred to as a micrometer, a micron is a metric unit of measure equal to one millionth of a meter. This unit is often used for describing sizes of airborne particles.

Montana Ambient Air Quality Standards (MAAQS)— Minimum standards set by DEQ for air pollutants, including criteria air pollutants, that must be met throughout Montana.

Montana Board of Environmental Review— Seven members, appointed by the Governor, who are representative of the geographic areas of the state. The membership must include persons who have expertise or backgrounds in the following areas: law, hydrology, local government planning, and environmental sciences. One of the members must be either a county health officer or a medical doctor. The Board is both a quasi-legislative and quasi-judicial board. Its duties include rulemaking and determining appeals of department decisions.

Montana Department of Health and Environmental Sciences (MDHES)— Created by the Executive Reorganization Act of 1971, which also established the Board of Health and Environmental Sciences (predecessor of the Montana Board of Environmental Review) as a separate, quasi-judicial body that concurs (or not) in issuance of certain licenses, permits, variances, etc. The Board may also adopt rules, regulations, and standards. The Board consists of seven members, appointed by the Governor.

National Ambient Air Quality Standards (NAAQS)— Minimum standards set by EPA developed for criteria air pollutants that must be met everywhere in the country.

National Emission Standards of Hazardous Air Pollution (NESHAP)— Federal standards developed by industrial source categories that limit hazardous air pollutant emissions.

GLOSSARY continued

New Source Performance Standard (NSPS)— Federal standards developed for industrial source categories to limit criteria air pollutant emissions.

Nonattainment Area— A geographic area in which the level of a criteria air pollutant is higher than the level allowed by the federal standards. A single geographic area may have acceptable levels of one criteria air pollutant, but unacceptable levels of other criteria air pollutants.

Oxidants— Substances that combines with oxygen..

Oxygenated Fuel (oxyfuel)— A special type of gasoline that burns more completely than regular gasoline in cold start conditions. More complete burning results in a reduction of carbon monoxide and particulates. In some parts of the country, carbon monoxide released from cars starting up in cold weather is a major contribution to air pollution.

Particles— Any solid or liquid matter larger than a molecule (>0.0002 micron diameter). It is composed of settleable matter (which will settle as dust within a reasonable period of time) and suspended matter (which remains suspended in the atmosphere until washed out by precipitation, deposited by impaction, or some other process).

Particulate Matter—Finely divided solids or liquids ranging in size from less than 0.1 micron to 50 microns in aerodynamic diameter. Gasses can form particles in the atmosphere through chemical reactions.

Pollutant Source— Any place or object from which pollutants are released. A stationary pollutant source can be

a power plant, factory, dry cleaning business, gas station, or farm. Mobile sources are cars, trucks, and other motor vehicles.

Prevention of Significant Deterioration (PSD)— A permitting program to prevent significant increases in air pollution to maintain the area's air quality that is already better than National Ambient Air Quality Standards (attainment areas).

Pulmonary— Pertaining to the lungs.

Regional Haze Rule— Revises the existing federal visibility regulations to integrate certain provisions addressing regional haze impairment that will apply to all states. The resulting regulation will reflect a comprehensive visibility protection program for all Class I areas except those on reservations.

Smog— A combination of high concentrations of pollutants under certain atmospheric conditions. London (England) smog arises as a result of the combined presence of sulfur oxides and particulates in a humid environment. Los Angeles smog or photochemical smog occurs when sunlight-generated reactions involving hydrocarbons, ozone, and nitrogen oxides take place. Smog is most visible when high concentrations of water vapor and certain ambient pollutants occur in the atmosphere simultaneously.

State Implementation Plan (SIP)— A detailed description of the programs a state will use to carry out its responsibilities under the Clean Air Act. SIPs are the regulations used by a state to reduce air pollution. The Clean Air Act requires that EPA approve each State

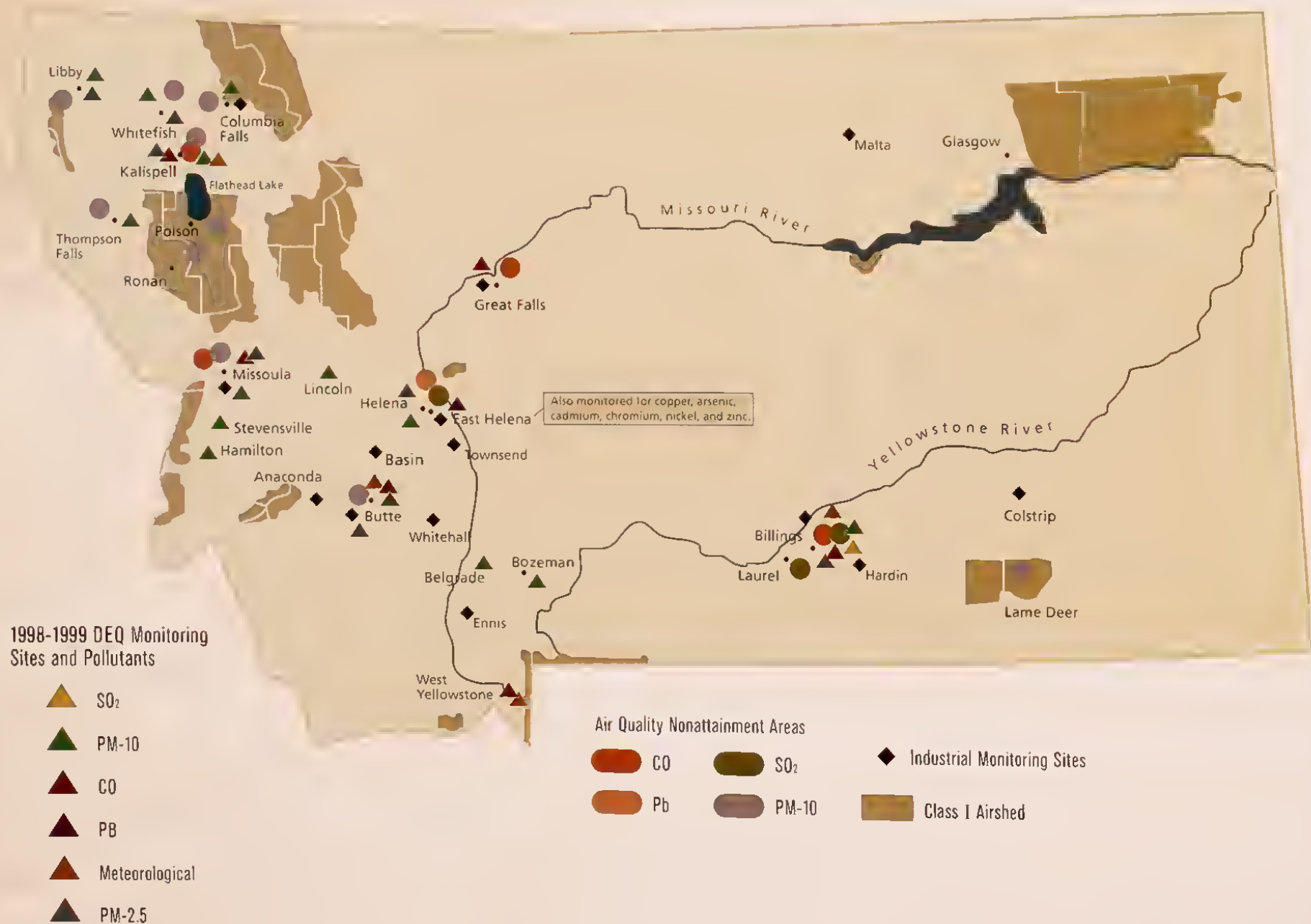
Implementation Plan. Members of the public are given the opportunity to participate in the review and approval of these plans.

Stagnation— With respect to air pollution, stagnation is the persistence of a given volume of stable air over a region, resulting in an abnormal buildup of pollutants from sources within the region.

Topography— The physical features of a place or region.

Volatile Organic Compounds (VOCs)— Compounds made up of carbon molecules that participate in atmospheric reactions caused by sunlight and heat.

APPENDIX A: MONTANA'S MONITORING SITES AND NONATTAINMENT AREAS



Federal and Montana Ambient Air Quality Standards for Criteria Pollutants

POLLUTANT	TIME PERIOD	FEDERAL	MONTANA	* scattering coefficient
<i>Carbon Monoxide</i>	Hourly average	35 ppm	23 ppm	g/m² grams per meter squared
	Eight-hour average	9 ppm	9ppm	ppm parts per million
<i>Fluoride in Forage</i>	Monthly Average	-	50 µ/gm	µg/m³ micrograms per cubic meter of air
	Grazing Season	-	35 µ/gm	
<i>Hydrogen Sulfide (H₂S)</i>	Hourly Average	-	0.05 ppm	
<i>Lead (Pb)</i>	90-day Average	-	1.5 µ/m ³	
	Quarterly Average	1.5 µ/m ³	-	
<i>Nitrogen Dioxide (NO₂)</i>	Hourly Average	-	0.3 ppm	
	Annual Average	0.053 µ/m ³	0.05 ppm	
<i>Ozone (O₃)^c</i>	Hourly Average	-	0.1 ppm	
	Eight-hour Average	0.08 ppm	-	
<i>PM-10</i> (pre-existing)	24-hour Average	150 µ/m ³	150 µ/m ³	
	Annual Average	50 µ/m ³	50 µ/m ³	
<i>PM-10</i> (revised)	24-hour Average	150 µ/m ³	-	
	Annual Average	50 µ/m ³	-	
<i>PM-2.5</i>	24-hour Average	65 µ/m ³	-	
	Annual Average	15 µ/m ³	-	
<i>Settleable Particulate Matter</i>	<i>30-day Average</i>	-	10 g/m ²	
<i>Sulfur Dioxide (SO₂)</i>	1-hour Average	-	0.50 pp	
	3-hour Average	0.50 ppm	-	
	24-hour Average	0.14 ppm	0.10 ppm	
	Annual Average	0.03 ppm	0.02 ppm	
<i>Visibility</i>	Annual Average	-	3 x 10 ⁻⁶ /m*	

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